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General Article

FISTULOUS WITHERS AND POLL-EVIL

Equine and Bovine Onchocerciasis Compared, with an account of the Life-Histories of the Parasites Concerned*

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Introduction

For some hundreds of years, fistulous withers and poll-evil have been considered as among the most unsatisfactory diseased conditions of horses that we, as veterinarians, and our predecessors the farrier surgeons, have been called upon to treat. The purpose of the present paper is not to give a complete description of fistulous withers and poll-evil but rather to bring up for discussion a few observations which may have some bearing on the ætiology, treatment and prevention of this disease.

The names in common use are, at least, mediæval in origin and no attempt seems to have been made to improve upon them. "Poll-evil" is apparently intended to be descriptive of an evil or diseased condition of the poll. Macqueen (1910) states that "in France it is called 'mole evil' because the swelling is like a mole hill and the subcutaneous passages in it are not unlike those of a mole." "Fistulous withers" would appear to indicate a fistulous condition of the withers, although the term is frequently applied to conditions in which a fistula or sinus does not exist though may in the course of the disease develop. The diseases have generally been considered as separate, though they would frequently appear to originate in the same structure, namely, the ligamentum nuchæ, and a more suitable name might possibly be "nuchal disease," anterior or posterior, according to the site involved. This name could be correctly applied to diseased states of the withers in which a fistula or sinus did not exist. Additional support for the name "nuchal disease" may be lent by the accumulation of evidence which goes to show that in typical cases the disease originates in the ligamentum nuchæ. It is therefore proposed to regard fistulous withers and poll-evil as manifestations in different sites of the same pathological condition (of the ligamentum nuchæ), with, of course, variations due to the anatomical differences of the regions affected.

The ætiology of the condition has been until recently quite obscure, and at the present moment two schools of thought exist favouring injury or specific infection as the cause respectively.

It is not only recently that the difference between traumatic and specific cases of the disease has been observed, for Gibson (1754), writing on poll-evil, states that "It generally proceeds from either some violent fever which casts itself off critically upon the poll, or from a decline in old horses worn out with poor fare and hard labour or from surfeits. In all which cases the cure is difficult and troublesome. When swelling of the poll is caused by a blow it may easily be cured" etc. Of fistulous withers, Gibson states that it arises "from neglected bruises, also malignant fevers; the former are not dangerous but it often begins deep, the cure then being exceedingly troublesome."

Williams (1908), in a general article on poll-evil and fistulous withers, distinguishes between "true" and "false" cases. He suggests that the latter are superficial in origin, whereas the former originate at the poll in the subligamentous area, and at the withers at a spot described by him as the "fenestrum," which is situated between the cordiform and lamellar portions of the ligament. He comments on the uneven distribution of the disease, which would hardly be expected were the origin purely traumatic; he is, in fact, opposed to the traumatic theory of origin of all deep cases, although he admits that superficial cases may arise in this manner.

The "false" or superficial cases are relatively few in number and are probably traumatic in origin, being much more easily and quickly cured than the typical cases.

Davis (1928) states that he had never been able to trace a case of either fistulous withers or poll-evil as directly due to traumatism, and observed that horses used continuously for town work were seldom affected. A further interesting observation was that on eight farms in his practice, which almost touched one another, he had met with eleven cases out of a horse population not exceeding 50. This is similar to an observation by Williams (*loc. cit.*) that perhaps 50 per cent.

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of the cases of fistulous withers and poll-evil in one practice might occur in about one-eighth of the area covered. A similar observation was made in a personal communication to the writer, by J. R. Barker. The area mentioned by him was then visited and the presence of *Onchocerca cervicalis* was demonstrated in three out of four cases seen.

An additional reason for discrediting trauma as the usual cause of nuchal disease is the occurrence of cases in horses that have never worked, and another reason may be that in most cases the disease appears to progress from within outwards, and in many cases there is no opening to the exterior.

The Association of *Brucella abortus* with Fistulous Withers and Poll-Evil

In France Rinjard and Hilger (1928) examined 15 cases of fistulous withers and poll-evil, and showed that in 13 the titre of the serum against *Br. abortus* varied from complete agglutination at 1 in 100 to partial agglutination at 1 in 1,000. In six cases cultures from the lesion were sterile, but in two of these *Br. abortus* was recovered by the inoculation of guinea-pigs; five of the remaining cases were mixed infections, and in two the discharges were not examined. They considered that the normal titre of horse serum for *Br. abortus* did not exceed 1 in 30, and that agglutination of from 1 in 50 upwards was positive. They stated that abortion in cattle was rare in this district before the war, but became more prevalent in the post-war period, and that intractable suppurations of the withers and poll, previously rare and nearly always due to wounds of harnessing, were subsequently very common and without recognisable external cause; further, they noted that these cases generally occurred on farms where there had been abortions in the cattle. The swellings (of the withers and poll) were extremely painful and persisted for periods of a few days to several months. If they were operated on surgically before breaking, an inodorous yellowish liquid containing fibrinous clots in suspension was obtained.

In the U.S.A. Fitch, Delez and Boyd (1930) examined samples of serum from seven cases of poll-evil and 37 of fistulous withers for agglutination against *Br. abortus*. In all the cases of poll-evil the titres ranged from 1 in 50 to 1 in 1,000. Pus was not obtained from any of these lesions for bacteriological examination. Of the 37 cases of fistulous withers examined, four showed no agglutinins at 1 in 25, but two of these had recovered two years or more; the remainder reacted at from 1 in 100 to 1 in 1,000. In nine of these cases bacteriological examination of the pus was made, and from three of them *Br. abortus* was obtained. Of 48 normal horses' sera four agglutinated *Br. abortus* at titres of from 1 in 50 to 1 in 250. The authors concluded that *Br. abortus* is associated rather closely with poll-evil and fistulous withers of horses. An examination of their table shows that all the sera giving complete agglutination at 1 in 1,000 (24 sera) were from active cases or from cases recovered not more than four months.

Bennetts and Filmer (1932), in Western Australia, examined the serum of a chronic case of fistulous withers with bilateral discharge, and found that it agglutinated *Br. abortus* at 1 in 100; the serum of a second case with "bursitis at the withers" and a much enlarged unopened bursa at the poll, agglutinated at 1 in 2,000. As controls, sera from three normal horses and from two affected with "quittor" were examined: four agglutinated at 1 in 20 and the fifth was negative.

From the above references and the investigations of numerous other workers not here quoted and the data in the series of cases recorded below it will be seen that infection with *Br. abortus* is a common occurrence in nuchal disease. As to its significance, however, there is little or no definite evidence.

Priestley (1934) has shown that the *abortus* agglutination titre of normal horses may be somewhat variable and appears to increase with age. He estimates that in this country from 5 to 15 per cent. of horses have specific antibodies in their blood.

Attempts have been made by various workers to reproduce the condition by administration of *Br. abortus* via the conjunctiva, alimentary tract or subcutaneous and intravenous injection. All such attempts have failed but in one or two instances the injection of cultures directly into the ligamentum nuchæ has given rise to lesions resembling the natural disease (Fitch, Bishop and Boyd, 1932).

Magnusson (1932a) has shown that *Br. abortus* may be present in the subcutaneous bursæ of cattle but suggests it is not the primary cause. The same writer (1932b) isolated this organism in two out of four cases of fistulous withers in horses, but concludes that its presence is probably secondary to an already established bursitis depending on some other cause. He infected nine horses via the conjunctiva but no localised lesions developed.

In the series of cases of nuchal disease recorded later in this paper it will be seen that 29 out of 42 (over 67 per cent.) showed *abortus* agglutinins in the serum.

The Association of Worm Parasites with Fistulous Withers and Poll-Evil

Bovett (1861) stated that he saw movement in what he thought were disintegrated fibres of ligament in the discharge from a case of fistulous withers and a more careful examination led to the detection of filarial parasites.

Railliet and Henry (1910) in a paper dealing with the classification of the species of *Onchocerca*, established *Onchocerca cervicalis* as a new species apart from *Onchocerca reticulata*. They stated that the former worm was very common in France.

Robson (1918) recorded the presence of filarial worms in cases of fistulous withers in Western Australia, and he stated that since finding the worm, all cases on which he had operated (except two of long standing) contained the worm; in both the exceptions there was marked calcification. Robson described a condition which he termed "dropped neck"—*i.e.*, an atrophy of the muscles in front of and between the withers; some of these cases had been affected with fistulous withers, and he considered that "dropped neck" and fistulous withers had the same ætiology and were similar except in degree. He stated that 75 per cent. of these cases recovered, but showed atrophy, and very commonly a depression in the median line of the neck; the remaining 25 per cent., all severe cases, resulted in sinus formation which discharged for several months, but finally recovered. Robson believed that arsenic given internally was a useful line of treatment, and he also injected iodine and potassium iodide deeply. Williams (*vide infra*) obtained good results with doses of potassium iodide in cases of recurrence.

Caslick (1922) examined the ligaments of 24 horses, one mule and one colt in the U.S.A. and found that 24 ligaments contained the worm and showed calcification; 24 were infested at the withers, 16 at the poll and 16 throughout the entire ligament. The most distinctive lesion of infested ligaments was calcification, a change which as well as parasitism, always affected the funicular portion.

Van Volkenberg (1923) cited the result of the examination of 102 ligamenta nuchæ from 68 horses, six colts, 26 cows and two mules. Calcified areas were found in 54 per cent. of the horses, but in none of the cows or mules. The calcified areas were always found either at the withers or at the poll, sometimes at both; usually the lamellar portion was not affected. At times the large calcified areas caused a bulging of the ligament which was visible externally as a hard swelling in the region of the poll or withers, generally on one side and rarely on both. "Ossification" was found in six cases. In some ligaments, areas were present in which the normal elastic fibres had been replaced by white fibrous tissue. It is possible that in these, instead of calcification, healing had taken place after some previous inflammation. In 22 of the cases a parasite resembling *Onchocerca cervicalis* was found. Van Volkenberg concluded that it was quite evident that the parasite caused calcification, though the worms could not be found in many of the calcified ligaments. This, he stated, might indicate another cause of calcification; or that possibly the ligament was previously infested, the parasite had died and disintegrated and the animal had not been reinfested. Those with the severest infestation were autopsied during the period March to May.

Ackert and O'Neal (1930) gave a description of *Onchocerca cervicalis*, and stated that in ten cases out of twelve an examination of the ligamentum nuchæ showed either portions of the parasite or calcified areas, which they regarded as characteristic of previous infestations. Of the twelve subjects examined, five showed external evidence of a diseased condition of the withers or poll and only one of these failed to reveal filariæ or calcification.

Dickmans (1932) has recorded the occurrence of a species of *Onchocerca* (*O. flexuosa*) in subcutaneous abscesses in deer.

Pillers (1931) recorded the presence of *Onchocerca cervicalis* in a case of poll-evil in this country, and in a later communication (1932) recorded an example of fistulous withers in which the worm was found.

The writer (Steward, 1933b) found that 20 horses out of 30 (66·6 per cent.) suffering from fistulous withers and poll-evil were infected with *Onchocerca cervicalis*. The results of the examination of 53 cases show that 38 out of the 53 (74·4 per cent.) harbour the parasite.

Normal Carriers of *Onchocerca cervicalis*

The writer has been able to show that recovered cases of nuchal disease may continue to harbour the parasites alive. If they did not do so, the spread of the parasite from horse to horse would be considerably restricted. The fact that some horses harbour the parasites and show no symptoms of disease is fully in keeping with what occurs in other parasitic diseases—a certain number of parasites in their normal habitat are of little or no importance, while large numbers cause disease. Border line cases, however, must exist where just such a number of worms is present as may be borne with impunity during robust health, yet when resistance is reduced, as by over work, malnutrition, etc., symptoms of disease appear. After a certain length of time, resistance to the parasites present may be re-acquired and symptoms disappear.

In 1932, the writer had the opportunity of testing the pathogenicity of a culture of *Br. abortus* on an apparently normal carrier of *Onchocerca cervicalis*; the culture was inoculated intravenously and the blood titre rose to 1 in 1,280 within five days, but no symptoms developed within twelve weeks. Unfortunately, it transpired later that the culture supplied was probably more or less avirulent. At *post-mortem* examination two small cavities were found in the ligamentum nuchæ; these con-

tained coils of the worms but showed no evidence of secondary infection. Microscopic examination confirmed the naked-eye appearance of an inflammatory reaction and destruction of ligamentous fibres in the neighbourhood of the worms.

Onchocerca cervicalis AND ITS LIFE HISTORY

The parasites are thin thread-like worms of the family Filaroidea. Males are 6 to 7 cm. in length and insignificant when compared with their females of which no complete specimen is known. Incomplete specimens obtained by the writer measured over 14 inches, the maximum width being up to 0·35 mm. The most striking characteristic of females of the genus *Onchocerca* is the remarkable spiral thickening of the cuticle which is most marked in the centre of the body, diminishing towards either extremity. A characteristic feature of the female is the anterior position of the vulva (0·64 to 0·8 mm. from the anterior extremity). This is a family characteristic and is presumably for delivery of the embryos into the blood stream—that is customary with Filariid worms, the embryos of which generally occur in the peripheral circulation. When these investigations started the habitat of the embryos of *Onchocerca cervicalis* was unknown. The circulating blood, the skin or discharge from the lesions (of fistulous withers or poll-evil) were considered to cover all possible habitats if the parasites were to be conveyed from horse to horse by intermediate hosts, as appeared likely. Blood, pus and skin all proved negative at first but repeated examination of skin showed this to be the normal habitat. When this was known the search for the vector became more hopeful. At first *Simulium* was suspected, as the development of the only *Onchocerca* whose life history was known had been shown by Blacklock (1926) to occur in *Simulium damnosum*. Further weight appeared to be added to this hypothesis by the abundance of *Simulium* in areas where the disease was prevalent. The rearing and feeding, and subsequent dissection, of large numbers of *Simulium* proved this to be wrong. However, every possible vector was being examined (not only *Simulium*) and within a relatively short time small midges of the genus *Culicoides* were found to be picking up the microfilariæ from infected horses. It proved necessary to keep these midges alive for up to three weeks to trace full development of the worms within the fly. Little was known of the rearing and breeding of these midges in the laboratory and the longest recorded life under laboratory conditions appears to be ten days (Dove, Hall and Hull, 1932). After a while it was found possible to keep a certain percentage of the midges alive for up to 30 days, but they had to be provided with blood meals on one's own hands.

The microfilaria of *Onchocerca cervicalis* is from 160 to 200 microns long by 2 to 4 microns wide with a blunt anterior, and pointed posterior extremity. It occurs in the subcuticular layer of the horse's skin, adjacent to and immediately beneath the glandular area, at a depth of 1·6 to 1·8 mm. from the surface of the skin. Development is as follows in *Culicoides nubeculosus*—The microfilariæ are ingested with blood from the infected horse, pass to the stomach or mid-gut and there remain for several days. Within a few days they migrate forwards into the thoracic muscles of the midge and there develop into relatively large sausage-shaped larvæ; these become longer and thinner and at about the 20th day migrate forwards into the head of the insect. By the 24th or 25th day the larvæ which have now reached the infective stage, have generally moved forward into the proboscis and when the midge feeds again on a suitable host they enter the skin through the puncture made by the proboscis. Emergence appears to take place through a membranous area at the tip of the proboscis. *Culicoides nubeculosus* was the only midge in which complete development was observed but indications were obtained that *Culicoides obsoletus* might possibly act as a vector and one specimen of *Culicoides parroti* became infected.

Culicoides pulicaris, which is almost identical in appearance and size with *C. nubeculosus*, was never found to pick up even one microfilaria, although over 140 were dissected after having fed on the infected horse.

Approximately only 5 per cent. of *C. nubeculosus* that fed on the horse became infected but it is not unlikely that if a more heavily infested horse had been available the percentage of flies infected might have been considerably increased. It is interesting to note that in spite of the proboscis of the midge being only 0·2 to 0·3 mm. long, they ingest the microfilariæ which occur at a depth of 1·6 to 1·8 mm. from the surface of the skin. It seems logical to conclude that the microfilariæ are attracted by the salivary juices of the midge, and this might explain their absence from other closely related species which are apparently not suitable vectors.

In addition, horse flies of the Tabanid genera *Hæmatopton* and *Chrysops*, mosquitos of the genera *Anopheles*, *Culex* and *Ochlerotatus*, some hundreds of Simuliids (*S. equinum*, *ornatum*, *morsitans*, *latipes* and *argyreatum*), *Stomoxys calcitrans* and a few Muscid flies were dissected and examined microscopically. Only flies of the genus *Culicoides* were found to become infected.

Culicoides nubeculosus is one of the largest British species of blood-sucking midges, having a wing measuring 2 to 3 mm. The wings have suffused dark markings on a pale ground and the dorsal surface of the thorax is conspicuously

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Fig. 1.— A portion of ligamentum nuchæ showing two cavities containing coiled specimens of *Onchocerca cervicalis*. *Magnification about 3½ diameters.*

[*Figures 1, 2, 6, 7 and 8 are reproduced here by kind permission of Professor J. B Buxton— having appeared previously in the 3rd Report of the Institute of Animal Pathology, University of Cambridge*]

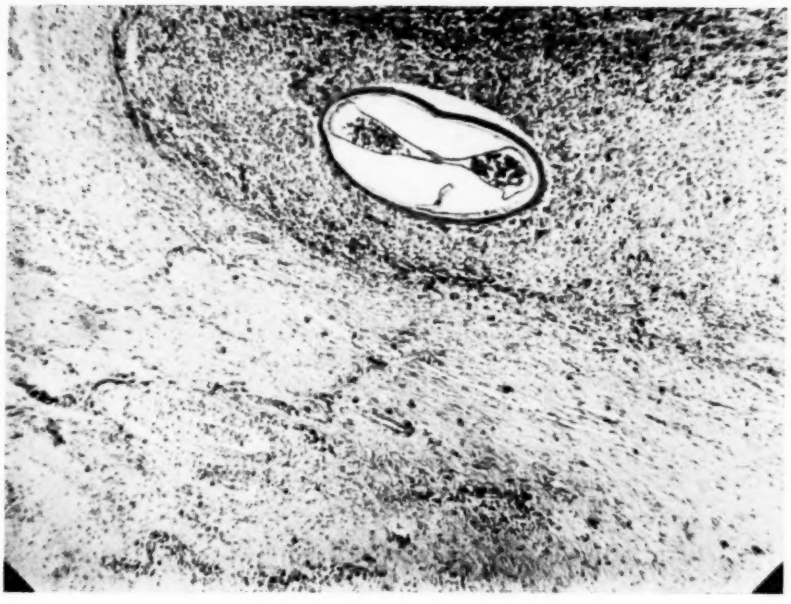

Fig. 2.—Portion of ligamentum nuchæ of a horse (suffering from fistulous withers) showing *Onchocerca cervicalis*. In contrast to *O. gutturosa* in the cow the parasite is in the substance of the ligament and surrounded by an inflammatory reaction.

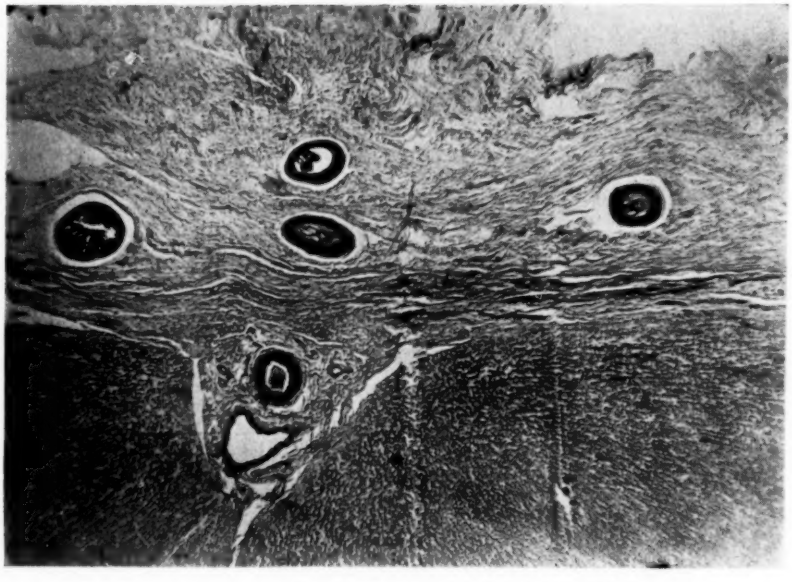

Fig. 3.—Lamellar portion of ligamentum nuchæ of a cow showing cross sections of *O. gutturosa* in the connective tissue on the (medial) surface of the ligament. × 55.

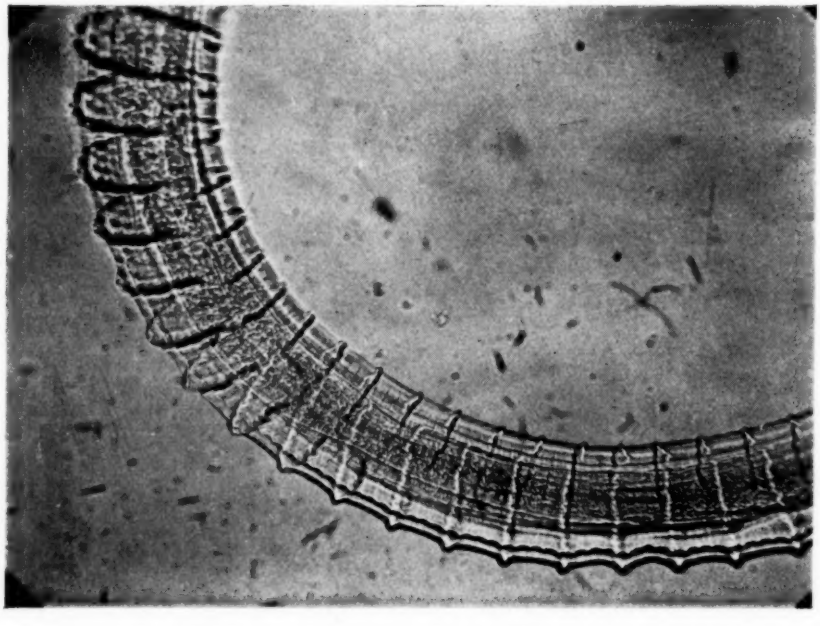

Fig. 4.—Female *Onchocerca* showing cuticular thickenings. × 65.

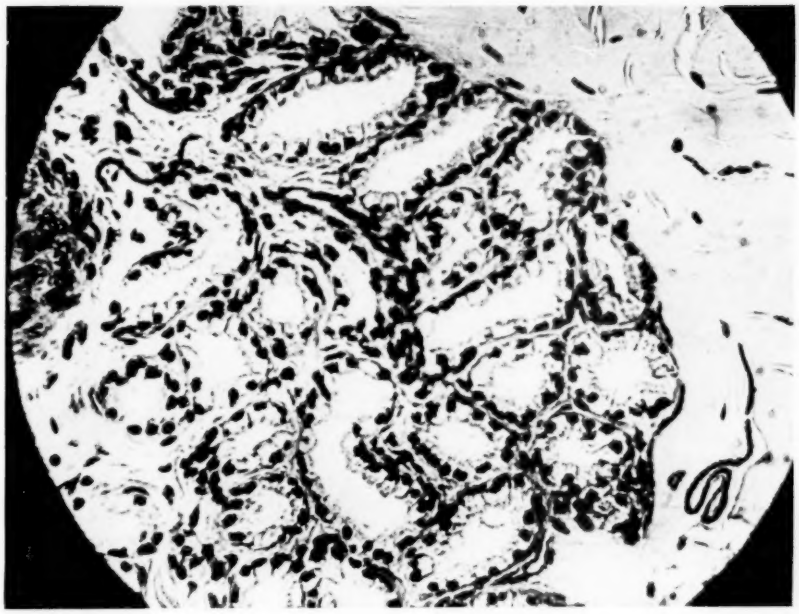

Fig. 5.—A section of horse's skin showing a microfilaria immediately beneath the sweat glands. × *approx. 300.*

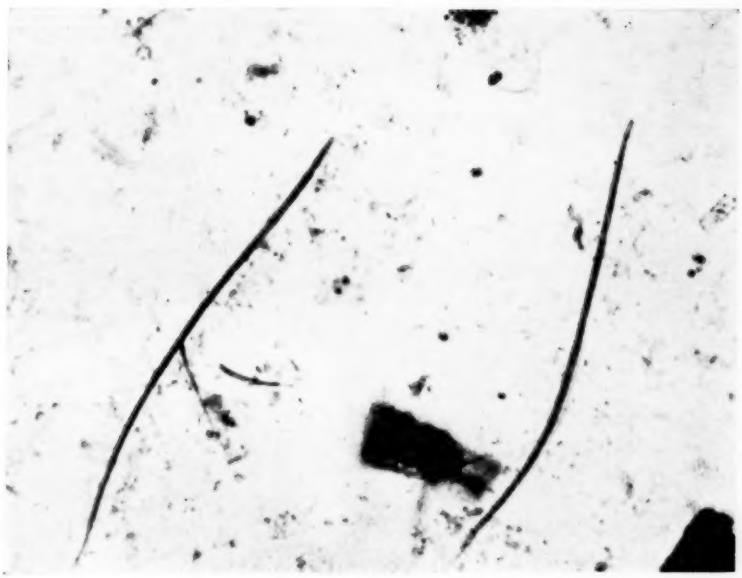

Fig. 6.—Two microfilariæ (*Mf. cervicalis*) from a dissection of the mid-gut of *Culicoides nubeculosus* 24 hours after feeding on infested horse. × *400.*

Fig. 7.—A developmental (" sausage ") form of *Mf. cervicalis* dissected out from the thoracic muscles of the midge, *Culicoides nubeculosus.* × *425.*

Fig. 8.—A longitudinal section of the head and thorax of *Culicoides nubeculosus* showing a developmental form of *Mf. cervicalis* in the upper portion of the thorax—14 days after the midge had fed on the infested horse. × *100.*

Fig. 9.—A dissection of the head of *Culicoides nubeculosus* (24 days after infection) showing two infective forms of *Mf. cervicalis*, one of which is in the proboscis.

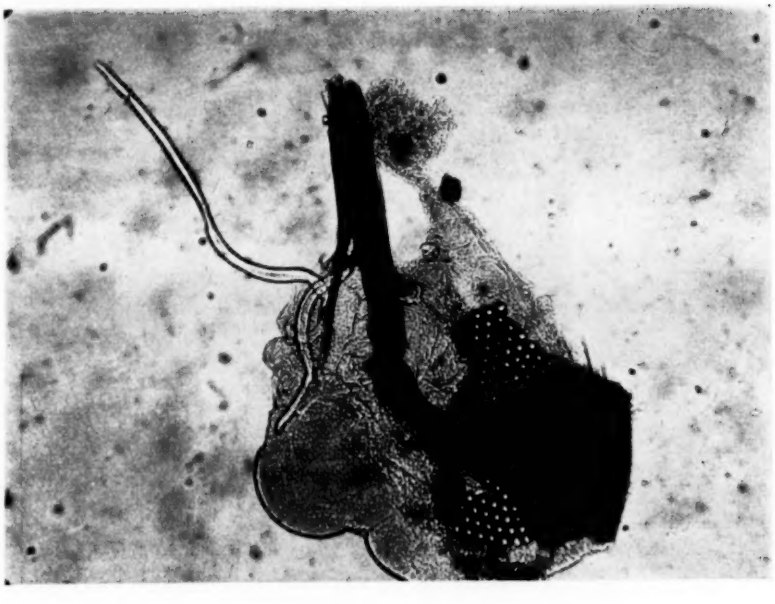

Fig. 10.—A dissection of the head of *Culicoides nubeculosus* 24 days after feeding on infested horse. Two infective forms of *Mf. cervicalis* can be seen, one being *in situ* in the proboscis. × *approx. 120.*

dark spotted. It was previously considered somewhat scarce and was not known to feed at all hours of the day.

A Series of Cases of Fistulous Withers and Poll-Evil

The cases are described in chronological order. A few details are given of the history of each, and the result of examination of the material obtained. The presence of the worm was established either by finding mature *Onchocerca cervicalis* in the ligamentum nuchæ, or their embryos (microfilariæ) in the skin. Failure to find either the mature worms or microfilariæ in any particular case does not necessarily mean that the worms were absent; they may have been present in such cases, but in an immature form, and, therefore, incapable of producing microfilariæ, or they may have died. In fact, some cases when first examined proved negative for microfilariæ, whereas when re-examined two to four months later, microfilariæ could be found. This probably indicates that the worms were not mature and reproducing when the case was first examined.

Case 1. (T. J. Hawkins, Herefordshire).

A seven-year-old chestnut cart mare affected with fistulous withers in the form of a firm swelling of six months' duration. The ligament was œdematous, and pus was absent when the swelling was operated upon (May 5th, 1932). *Onchocerca cervicalis* was present. At the time of operation the serum did not agglutinate *Br. abortus* at a dilution of 1 in 10, and guinea-pigs inoculated with washings of the œdematous tissue did not yield *Br. abortus*, but three weeks after the operation a little of the purulent discharge, which had then developed, was inoculated into guinea-pigs, and from them *Br. abortus* was later recovered. At the same time (three weeks after operation) the mare's serum showed complete agglutination of *Br. abortus* at 1 in 80, but three months later (August 5th, 1932) the agglutinins had disappeared. It would seem that the *Br. abortus* was not present at the time of operation, but became established later for a short period.

Case 2. (Barnaby, Herefordshire).

A blue roan cart mare affected with fistulous withers. The ligamentum nuchæ contained greyish-yellow nodules. The presence of *Onchocerca cervicalis* was not demonstrated, although it was subsequently shown to be present in a case of poll-evil which occurred later on the same farm (case 32). The serum and discharge were not examined.

Case 3. (Holtum, Herefordshire).

A cart-horse suffering from fistulous withers which was first operated on a year previously. The serum did not agglutinate *Br. abortus* and *Onchocerca cervicalis* was not found.

Case 4. (Langford, Hereford).

A bay cart-horse with fistulous withers of 13 months' duration. When first seen on April 30th, 1932, *Onchocerca cervicalis* was not found (the serum was not examined). At a later date, February 3rd, 1933, the horse was re-examined, and again *Onchocerca cervicalis* could not be demonstrated, while the serum agglutinated *Br. abortus* at a titre of 1 in 20 only.

Case 5. (Carter, Herefordshire).

A blue roan cart mare which had been on the same farm for seven years and was affected with a fibrous, painless unopened swelling at the withers. When first seen on June 13th, 1932, *Onchocerca cervicalis* was present. Serum taken on June 20th, 1932, did not agglutinate *Br. abortus*.

Case 6. (Davies, Herefordshire).

A bay cart-horse suffering from fistulous withers with considerable discharge and much fibrous tissue. *Onchocerca cervicalis* was not found when examined on April 27th, 1932. On February 4th, 1933, the horse was re-examined, and at this date microfilariæ of *Onchocerca cervicalis* were found in a specimen of skin. The serum then showed complete agglutination of *Br. abortus* at 1 in 40 and partial agglutination at 1 in 80. *See also Cases* 24 *and* 25.

Case 7. (————, Hereford).

A four-year-old hunter with a history of a bite from another horse, affected with a large fluctuating abscess of the withers. The presence of the worm was not demonstrated, and the pus, of which there was a large quantity, contained streptococci and staphylococci. A piece of tissue removed at operation was sectioned, and showed the histological structure of a granuloma, *i.e.*, there was a considerable amount of granulation tissue with areas of necrosis and masses of leucocytes and organisms. The abscess was quite superficial and healed rapidly when drained. The serum did not agglutinate *Br. abortus*, and that organism was not found in the discharge.

Case 8. (Griffin, Gloucestershire).

An aged cart mare suffering from fistulous withers with considerable fibrous swelling and a thin serous discharge mixed at times with a little pus. A smear showed Gram-negative bacilli and a few Gram-positive cocci. *Onchocerca cervicalis* was present. The serum was negative for *Br. abortus* agglutinins, and *Br. abortus* was not recovered from the pus. On neighbouring farms, cases of fistulous withers had occurred 18 to 24 months and four years previously.

Case 9. (Thomas, Monmouthshire).

A three-year-old bay cart gelding. A large tense swelling containing pus "suddenly" appeared on the left side of the poll. The lymph vessels, which were much enlarged, were visible running downwards and backwards from the swelling on the side of the neck. At this time the serum agglutinated *Br. abortus* at a 1 in 400 dilution. A swab of pus taken when the abscess had opened (ten days later), contained non-hæmolytic streptococci. *Br. abortus* was not isolated and *Onchocerca cervicalis* was not discovered. The horse had been severely ill after the breaking of the abscess, and when last seen was in a poor condition, and showed exfoliation of the surface epithelium over the whole of the body. At this date, eleven weeks after first being seen, the agglutination titre of the serum for *Br. abortus* was 1 in 1,600.

Case 10. (Parker, Herefordshire).

A ten-year-old cart mare which had recovered from fistulous withers two years previously. On June 14th, 1932, when healthy, it was examined for the presence of *Onchocerca* (*Mf.*) *cervicalis* with negative results; several months later (October 16th, 1932) it again developed fistulous withers and when re-examined, *Onchocerca cervicalis* was found, while the serum agglutinated *Br. abortus* completely at 1 in 100, and partially 1 in 160; the pus showed staphylococci and streptococci.

Case 11. (Parker, Herefordshire).

A fifteen-year-old cart mare which had re-

covered from poll-evil and fistulous withers about two years previously. On June 14th, 1932, when healthy, the presence of *Onchocerca cervicalis* could not be demonstrated. The poll-evil recurred a few days before October 16th, 1932, but again the presence of *Onchocerca cervicalis* could not be demonstrated. The serum on October 16th, 1932, agglutinated *Br. abortus* completely at 1 in 100 and partially 1 in 160. Staphylococci and streptococci were present in the pus. It is interesting to note that three out of four horses belonging to the same owner had been affected with poll-evil and fistulous withers two to three years previously. On June 14th, 1932, six of his horses were examined. All six were then normal, while three were recovered cases, aged seven, ten and 15 years, respectively; two of the others were six years old and one eight years old. These animals were examined for microfilariæ, and five proved to be negative, but the eight-year-old horse, which had never been affected and was apparently normal, was positive. This horse was probably acting as a carrier of the worm, and may perhaps have been responsible for the infection of Case 10. The serum showed complete agglutination of *Br. abortus* at 1 in 10, partial 1 in 20 and a trace at 1 in 40.

Case 12. (Ridley, Shropshire).

A black cart-horse, eight years old, purchased by the owner in August, 1931, and suffering from fistulous withers when seen on October 17th, 1932. The swelling was first noticed in May or June, 1932, and it broke during July. The swelling first appeared on the right side of the withers, and was lanced by the owner, but the opening regularly closed up and the swelling appeared on the opposite side. Fibrous tissue formed to a depth of several inches, and the swelling appeared to be painless. *Onchocerca cervicalis* was present, and the titre of the serum was complete at 1 in 80. There were areas of calcification in portions of the ligament removed at operation. Material, not obtained personally, from Case 12 proved negative for *Onchocerca cervicalis*, though material obtained personally three days later, was positive.

Case 13. (Ridley, Shropshire).

An eight-year-old bay cart mare, the property of the same owner as the previous case, which had been purchased by the owner just over a year before. The mare foaled at the end of May, and had not worked after the middle of that month. The swelling, which was on the left side of the withers, and showed a considerable amount of fibrous tissue, appeared in June or July, and was seen on October 18th, 1932. *Onchocerca cervicalis* was found and the serum agglutinated *Br. abortus* completely at 1 in 160. A pure culture of a hæmolytic streptococcus was isolated from the discharge taken at the time of operation from a deep pocket of pus previously unopened.

Case 14. (Olliver, Staffs.).

A five-year-old cart mare, which, when seen on October 17th, 1932, was affected with poll-evil. She had been on this farm for three or four years, and there had been no previous cases in that time. In June the mare fell backwards into a pit, but showed no signs of injury at the time. Two months before operation she lost flesh and became weak and ill, though she was in better health at the time of operation. The swelling was first noticed at the poll two to three weeks previously, and broke eight days before the mare was seen. At operation 2½ lb. of adventitious tissue were removed. *Onchocerca cervicalis* was present. The serum agglutinated *Br. abortus* at 1 in 400 and *Staphylococcus aureus* and a hæmolytic streptococcus were obtained from pus. Calcification was present in portions of ligament removed at the time of operation.

Case 15. (————, Herefordshire).

A seven-year-old cart gelding affected with a large fibrous swelling on either side of the withers. *Onchocerca cervicalis* present. The serum and discharge were not examined.

Case 16. (Powell, Herefordshire).

An aged pony suffering from fistulous withers with considerable fibrous swelling. *Onchocerca (Mf.) cervicalis* was not found on October 27th, 1932, but when re-examined on March 1st, 1933, the parasite was present. The serum showed complete agglutination of *Br. abortus* at 1 in 20.

Case 17. (Joyner, Worcestershire).

A cart mare showing a considerable fibrous, unopened swelling of the withers which had been noticed for three or four weeks. A heavy infestation of *Onchocerca (Mf.) cervicalis* was found. The serum was not examined.

Case 18. (Penlington, Worcestershire).

A cart mare showing an unopened fibrous swelling of the withers of at least five to six weeks' duration. *Onchocerca (Mf.) cervicalis* was present. The serum was not examined.

Case 19. (Bloor, Staffs.).

A nine-year-old cart mare which, when operated on in February, had been suffering from fistulous withers of six weeks' duration. When seen on October 31st, 1932, considerable swelling was still present. *Onchocerca (Mf.) cervicalis* was not demonstrated. The serum agglutinated *Br. abortus* at 1 in 400.

Case 20. (Price, Staffs.).

A twenty-year-old cart-horse which had been operated on twice for poll-evil twelve months and six weeks previously. When examined (October 31st, 1932) *Onchocerca (Mf.) cervicalis* was found. The serum was negative for agglutinins against *Br. abortus*. A case of fistulous withers had occurred on the same farm seven years previously.

Case 21. (Jackson, Staffs.).

A twelve-year-old nag mare affected with a soft swelling at the withers which had broken nine months previously. Her dam also suffered from fistulous withers. *Onchocerca (Mf.) cervicalis* was not found. The serum agglutinated *Br. abortus* at 1 in 80.

Case 22. (L.M.S.R., Staffs.).

A railway horse affected with fistulous withers. *Onchocerca (Mf.) cervicalis* was not found and agglutinins against *Br. abortus* were absent from the serum.

Case 23. (Parker, Herefordshire).

An eight-year-old bay cart-horse, belonging to the same owner as Cases 10 and 11, had suffered 2½ years previously from fistulous withers, and a specimen of its skin when the animal was healthy was examined for microfilariæ on June 14th, 1932, without result. When seen on February 2nd, 1933, there had been a recurrence of the fistulous withers four to five weeks previously, and on this occasion microfilariæ of *Onchocerca cervicalis* were found in the skin. There was no agglutination of *Br. abortus* in dilutions of 1 in 10 upwards.

Case 24. (Davies, Herefordshire).

An aged pony, in the same ownership as Cases 6 and 25. This pony had shown a swelling of the withers in December, 1932. The swelling was opened and drained with complete recovery by February 4th, 1933, when a specimen of skin

examined showed the presence of microfilariæ of *Onchocerca cervicalis*. The blood serum showed complete agglutination of *Br. abortus* at 1 in 80 and partial at 1 in 160.

Case 25. (Davies, Herefordshire).

An aged black cart-horse, the property of the same owner as Cases 6 and 24. An abscess developed at the withers in January, 1933, and this was lanced. On March 4th, 1933, this horse showed a large fibrous swelling with discharging sinuses on both sides of the withers. *Onchocerca* (*Mf.*) *cervicalis* was present. The serum agglutinuated *Br. abortus* completely at 1 in 40 dilution and partially at 1 in 80 dilution.

Case 26.

A six-year-old bay cart gelding suffering from poll-evil was seen on March 2nd, 1933. *Onchocerca cervicalis* was not found, and the blood serum agglutinated *Br. abortus* up to 1 in 640. Staphylococci were present in the discharge; *Br. abortus* was not recovered in cultures or from guinea-pigs which were inoculated with the discharge.

Case 27. (————, Surrey).

An eight-year-old bay cart gelding suffering from poll-evil was seen on March 2nd, 1933. *Onchocerca cervicalis* was found and the serum agglutinated *Br. abortus* up to 1 in 80, but the organism was not recovered from cultures nor from guinea-pigs inoculated with the discharge.

Case 28.

A black pony gelding suffering from fistulous withers, was seen on March 2nd, 1933. *Onchocerca cervicalis* was present and the serum agglutinated *Br. abortus* up to 1 in 320. The discharge was not examined.

Case 29.

An aged brown horse affected with fistulous withers was seen on March 2nd, 1933, and found to be harbouring *Onchocerca cervicalis*. The serum agglutinated *Br. abortus* at 1 in 40. The discharge was not examined.

Case 30. (Marshall, Herefordshire).

An aged brown cart gelding which first suffered from fistulous withers about two years previously. The disease recurred and was in existence about six months prior to the date of examination (March 19th, 1933). *Mf. cervicalis* were found, and the serum agglutinated *Br. abortus* completely at a 1 in 80 dilution, and almost completely at a 1 in 160 dilution. There was a case of fistulous withers on a neighbouring farm about two years before this horse was first affected.

Case 31. (Griffin, Gloucestershire).

This cart mare, which had been suffering from fistulous withers for two or three months, was a contact of Case 8 which harboured *Onchocerca*. The presence of the parasite was not, however, demonstrated in this case, and agglutinins against *Br. abortus* were absent, but only one examination was possible. Treatment was unsatisfactory and the case was destroyed as incurable.

Case 32. (Barnaby, Herefordshire).

This cart gelding showed an unopened swelling at the poll and was found to harbour *Onchocerca* (*Mf.*) *cervicalis* and agglutinins against *Br. abortus* were absent. This case was a contact of Case 2 in which the parasites were not discovered.

Case 33. (Noble, Cambridgeshire).

A seven-year-old cart-horse which had been affected for several months, showed a large fibrous swelling at the withers with several sinuses. Agglutinins against *Br. abortus* were absent, but the presence of *Onchocerca* (*Mf.*) *cervicalis* was demonstrated. This was the only case examined in Cambridgeshire or the East of England, and it is interesting to note that *Onchocerca cervicalis* was present, because it had been suggested (as no other evidence was available) that the parasites were peculiar to the West of England where most of the cases examined occurred.

Case 34. (Ball, Herefordshire).

A cart gelding which had been affected with fistulous withers for about nine months. Originally the right side was affected, but the swelling had subsided and only a small sinus remained; on the left side, however, there was a very large swelling which extended externally down to the tuber scapulæ. The agglutination titre of the serum was 1 in 200 and it was not possible to demonstrate the microfilariæ. There were three other cases within a short distance of this case, two of which were infected with the worms (Cases 37 and 38).

Case 35. (Davies, Herefordshire).

This pony had suffered on and off from fistulous withers for about a year; on the day of examination there was a small swelling which was not particularly painful. Agglutination was complete at 1 in 80 and partial at 1 in 160. *Onchocerca* was present. The pony was kept in a fold just outside the cart-horse stables—*Culicoides nubeculosus*, the carrier of the worms, was known to breed here.

Case 36. (Souter, Herefordshire).

This cart mare was observed to have been stiff in the neck two months before the swelling appeared at the withers, and about three months elapsed before operation, at which time considerable fibrous swelling existed on both sides of the withers. A sinus led to the ligament from the left side and on the right to the upper edge of the scapula. The parasites were not demonstrated, and the serum was not examined. Streptococci and staphylococci were present in the discharge.

Cases 37 *and* 38. (Harrison, Herefordshire).

These were a five-year-old cart mare and a seven-year-old pony which had suffered from fistulous withers for six months and six weeks respectively. Both had been on the farm for two years and showed heavy infestations of *Onchocerca* (*Mf.*) *cervicalis*. The serum of both was negative for agglutinins against *Br. abortus* although abortion was rife amongst the cows on the farm. It is interesting to note that the pony was associated with the farm horses as also were the other affected ponies (Cases 24 and 35).

Cases 39, 40 *and* 44. (Sussex).

All three horses were hunters and Cases 39 and 40 showed symptoms simultaneously and belonged to members of the same family but were stabled more than one mile apart during the winter. During the previous summer, however, they had been at pasture together and also in the company of Case 44, which was in the same ownership as 40.

Case 39.

"Whiskers" — a ten-year-old gelding, showed agglutination at 1 in 640, microfilariæ in the skin and streptococci and staphylococci in the aspirate from the unopened swelling.

Case 40.

"Plain Jane"—an 11-year-old hunter mare, developed fistulous withers at the same time during March, 1934. The agglutination titre was 1 in 320, staphylococci were

present in the aspirate from the lesions and microfilariæ were not found, though material taken at operation sometime later showed the presence of *Onchocerca cervicalis*.

Case 44.

A black hunter gelding developed fistulous withers about a month after Cases 39 and 40. The parasites were present in the ligamentum nuchæ and the titre against *Br. abortus* was 1 in 160. Cattle infected with contagious abortion had grazed the same pastures during the summer of 1933.

These three cases are the first where it has been suspected that infection with *Onchocerca* had occurred at pasture. An apparently suitable breeding place for the midges existed in a stagnant brook which lay in the pastures.

Cases 41 *and* 42. (Elliott, Herefordshire).

The subjects were a 14-year-old grey cart gelding and a four-year-old bay cart gelding, both suffering from fistulous withers. The former case had been in existence about nine months and showed a heavy infestation with *Onchocerca* (*Mf.*) *cervicalis* and an agglutination titre of 1 in 640. The younger horse showed an unopened swelling on the left side of the withers, which had existed for six weeks when first seen, and was negative on examination for microfilariæ on two occasions. Agglutination was complete at 1 in 1280.

Case 43. (Kirk, Staffs.).

This 16-year-old mare had been suffering from fistulous withers for about seven weeks. The only material examined was tissue removed at operation and this was found to contain adults of *Onchocerca cervicalis*. Skin examined a week after operation showed the presence of microfilariæ.

Case 45. (Professor McCunn).

This cob was suffering from an acute and very painful type of fistulous withers—agglutination up to 1 in 160. Examination of the skin failed to reveal the presence of microfilariæ. Tissue removed at operation, however, showed adult worms that were dead and partly calcified. This case is useful in showing that the parasite may be present without microfilariæ being found in the skin. The acuteness of the condition may be attributed to secondary pyogenic infection.

Case 46. (Cambidge, Staffs.).

This five-year-old Shire mare had been affected for three weeks, and the swellings had been lanced on both sides of the neck. Fibrous tissue was formed rapidly. *Onchocerca* (*Mf.*) *cervicalis* was present and the serum titre was 1 in 320.

Case 47. (————, Derbyshire).

This eight-year-old mare had been suffering from an unopened swelling of the withers for three months. Examination for *Onchocerca* (*Mf.*) *cervicalis* was negative. Blood serum agglutinated *Br. abortus* at 1 in 80, whilst the thick liquid aspirated from the lesion agglutinated at 1 in 640. A possible explanation is that the liquid from the lesion was more or less concentrated serum. *Br. abortus* was isolated culturally from this liquid. Thirty per cent. of the cows on this farm reacted to the agglutination test.

Case 48. (Hart, Sussex).

This cart mare had suffered from fistulous withers for some months and was destroyed. The only material examined was ligamentum nuchæ removed at *post-mortem*—adult *Onchocerca cervicalis* was present in the most obviously diseased portions of the ligament.

Case 49. (Thomas, Herefordshire).

This cart gelding had suffered from a swelling at the withers for some time and was on the neighbouring farm to Case No. 1. *Onchocerca* (*Mf.*) *cervicalis* was present and agglutination occurred at a dilution of 1 in 1280.

Case 51. (Cope, Nottingham).

Only *post-mortem* material was available from this 26-year-old half-bred hunter which had suffered some time from fistulous withers. On dissection several sinuses were discovered which all led to a large central cavity in the ligamentum nuchæ. *Onchocerca cervicalis* was found in the most inflamed area in the ligamentum nuchæ. Microfilariæ were not found in the skin, but this was not taken until just after death—it is possible that the microfilariæ may disappear at death.

An analysis of the cases recorded above shows that the serum of 29 out of 43 affected horses so examined agglutinated *Br. abortus* at dilutions of 1 in 20 upwards (67·4 per cent.) whilst 13 were negative (*i.e.*, 32·6 per cent.).

Thirty-eight out of 53 affected horses were shown to harbour *Onchocerca cervicalis* (74·4 per cent.) and it is probable that the percentage infected is much higher, as a negative result in the examination for microfilariæ may easily be misleading, *e.g.*, Case 45 where the adult worms were found to be dead in material obtained at operation.

Although it may be rash to speculate as to the ætiology of fistulous withers and poll-evil, an attempt to classify the types met in the foregoing series of cases may be of some interest and help for further investigation.

A Suggested Classification of the Types of Nuchal Disease.

1. *Onchocerca*-infected cases without secondary infection, *e.g.*, cases 1, 5, 17, 18, etc. (Secondary infection may occur subsequently and will almost certainly follow exploratory or operative interference.)

2. *Onchocerca*-infected cases plus *Br. abortus* infection, *e.g.*, cases 39 and 40, etc. These may later develop into the third type if infection with pyogenic organisms occurs.

3. *Onchocerca* infection plus secondary pyogenic infections as with streptococci (Case 13) or staphylococci (Case 27) or both (Case 14).

4. Infection with pyogenic organisms alone —these are probably the superficial or non-typical cases, possibly of traumatic origin, as probably Case 7.

5. A possible fifth type may be infection with *Brucella abortus* alone or complicated with secondary pyogenic infection, *e.g.*, possibly Cases 9 and 47.

The writer would only be satisfied that cases of the fifth type do occur by a *post-mortem* examination (microscopic as well as macroscopic) since from experience already gained it seems impossible to state with certainty that the worm parasites are absent on the result of

negative skin examinations alone. Examinations for microfilariæ that give negative results cannot be held to exclude the presence of the worms, because these may be present as immature live specimens or dead adults—in both cases microfilariæ would be absent (*e.g.*, Case 45 —dead adults present).

In this connection one may deplore the futility of examining affected horses only for the presence of *Br. abortus*—numerous records exist of the occurrence of this organism in cases of fistulous withers and poll-evil throughout the greater part of the world, but apparently none of the cases recorded as *abortus*-infected have been adequately searched for the presence of *Onchocerca*. Throughout the present series of cases the attempt has been made to investigate cases from every view point—not only for the presence of parasites but also of *Br. abortus* and other organisms wherever possible.

A. *Clinical Symptoms.*

With regard to clinical manifestations of the suggested types of infection, the first type can often be accurately suspected where a more or less painless and œdematous and later fibrous, enlargement of the withers or (less commonly) the poll exists. The swelling may disappear under favourable circumstances without recurrence. On the other hand, secondary (pyogenic) infection may supervene and cases of Type 3 develop. These are characterised in the earlier stages by a more severe and painful inflammatory condition with a tendency to abscess and subsequently sinus formation.

One might suspect a case to fall into the second group where a more or less pronounced swelling existed with the suggestion of fluid within, without the acute pain or tendency to "point" or burst spontaneously that one sees in cases undergoing pus formation.

Cases of the fourth type may be more or less like a superficial abscess in nature with the usual attributes of inflammation, namely, pain, heat, swelling, etc., and without sinuous tracts leading to the ligament.

B. *Microscopic Anatomy.*

1. Microscopic examination of uncomplicated *Onchocerca* cases shows fibroblastic stimulation with œdema and destruction of the fibres of the ligament and subsequently a tendency to a marked cellular exudation around the worms, consisting of the cells commonly associated with chronic inflammatory conditions, namely, lymphocytes, plasma cells and large numbers of macrophages. In addition, a very marked tissue eosinophile reaction may be observed—common in parasitic conditions. Apparently a later stage is a tendency to replacement fibrosis of destroyed ligament. Giant cells of a foreign body type are occasionally present with areas of tissue necrosis.

2. In *Onchocerca* cases complicated with secondary pyogenic infection the picture is complicated by hæmorrhage and much fluid exudation with profuse granulation tissue formation. The same types of cells are present with, however, a predominance of polymorphonuclear leucocytes.

(*I am indebted to my former colleague—Dr. J. R. M. Innes—of Cambridge, for assistance with the microscopic anatomy of these cases.*)

C. *Treatment.*

It is not proposed to do more than mention briefly what appear to be the more important features of treatment as suggested by the present series of observations. Cases of the first type (*Onchocerca* only) should certainly be left unopened as long as possible. As Professor Macqueen (1910) says: "Thank God for every day the distended bursa remains closed."

Cases of the second type may be treated in the same way with the addition of vaccine therapy if that be considered useful.

Cases of the first type and possibly the second may respond to improved dietetic conditions alone and rest. Such cases very frequently follow a period of poor diet and over-work, and some recover spontaneously on removal to rich pastures and rest. In the words of the Ancients, "attend to the state of the blood" (J. Wood, 1757).

Where the secondary pyogenic infection has occurred, surgical interference is indicated, the object of which is to provide and maintain drainage and the removal of necrotic tissue. The best results often seem to follow the middle-line operation at either the poll or withers. A cardinal advantage of the mid-line incision without removal of large quantities of tissue, is that if successful no traces of the operation are visible. Some operators favour more vigorous operative measures, but these are followed by permanent deformity and possibly considerable suffering.

Vast numbers of antiseptics, caustics and escharotics have been used, but it is doubtful if the attempt to secure asepsis by the use of antiseptics is ever successful.

Useful adjuvants to local treatment of infected cases may be an improved dietary, autogenous vaccines, continuous irrigation with hypertonic or normal saline, etc. Ultra violet rays may be of value in some cases.

Treatment by the implantation of maggots in imitation of the Baer treatment of human chronic osteomyelitis has been recorded by Dunn (1935) but was previously used in Australia as recorded by "Rover" (1904), the general belief being even then that the maggots lived on and consumed the diseased tissue only. The species used by Baer were *Phormia regina* and *Lucilia* spp., the eggs being sterilised and

larvæ reared aseptically on rat embryos obtained by Cæsarian section.

No specific is known, but if sufficient evidence exists to justify the belief that the worm parasites are the primary cause, then a careful investigation of the most suitable anthelmintics might prove of value.

In any case, treatment is not likely to be successful unless the diagnosis is correct; for instance, to treat an infected (pyogenic) case as an uncomplicated *Onchocerca* case is waste of time.

D. *Suggestions for the Prevention of Spread of Onchocerca cervicalis.*

Measures may be adopted against either the worm or its vector or both.

1. Control of the vector may be attempted—possibly by either drying up the breeding places or treating with larvicidal drugs or sprays. It was observed that an excellent breeding place of *C. nubeculosus* was ruined by the liquid waste products from the manufacture of cheese—fermentation took place and an acid reaction of the liquid manure was produced causing the death of the larvæ.

2. Removal and segregation of all carriers of the worm parasites from the haunts of the vector, which does not range far from the breeding grounds; this, of course, need only be practised during the fly season.

The breeding place of *Culicoides nubeculosus* is principally liquid farm manure and collections of stagnant water containing more or less abundance of green slime and decaying organic matter. Running water does not appear to be suitable as in the case of the Simuliidæ.

Bovine Onchocerciasis.

It may be interesting to consider for a moment a non-pathological *Onchocerca* infection of the ligamentum nuchæ of cows, and endeavour to explain its non-pathogenicity in cattle. The parasite of cattle is *Onchocerca gutturosa*, which is quite common in English cattle though not recorded as occurring in this country. Its habitat is in the connective tissue BETWEEN the lamellar portions of the ligamentum nuchæ and it only causes a slight œdema of the connective tissue in this area. In the horse, however, *Onchocerca cervicalis* occurs actually IN THE SUBSTANCE of the *ligament* with destruction of ligamentous fibres, etc. Cows infected with this worm generally harbour similar parasites in the gastro-splenic connective tissue, and examination of specimens from both sites suggests that they are one and the same species with, however, slight cuticular differences which may be due to the difference of their habitats.

Onchocerca gutturosa is obviously closely related to *Onchocerca gibsoni*, the cause of "worm nodules" or "nests" in Australian cattle, and in view of the great economic importance* of the Australian parasite and the complete lack of information as to its life history, the method of transmission of the English species may be of interest.

The Life History of *Onchocerca gutturosa*.

It is not proposed to describe this in detail here, but merely to state that it occurs in a species of *Simulium* and is very similar to the development of *Mf. cervicalis* in *Culicoides*. Development appears to be complete in some cases as early as the 19th day. Very few infected Simuliids were available, but fortunately permanent preparations were made illustrating every stage of development, and these will be exhibited for comparison with similar preparations of the life history of *Onchocerca cervicalis*. *Culicoides nubeculosus* does not appear to be capable of picking up the microfilariæ of *Onchocerca gutturosa* which occur in the skin of the cow in the same situation as *Mf. cervicalis* in the horse.

Discussion

In considering the ætiology of equine nuchal disease, the geographic and local distribution and peculiarities in the occurrence of the condition may be important. For instance, if *Onchocerca* is of primary importance the occurrence of the vector (*Culicoides*) will be of obvious moment. Macfie (1932) states that *Culicoides* does not occur in New Zealand, so one would not expect to find nuchal disease to be common there if *Onchocerca* is the commonest primary cause. Information on this point may be of value. Scott (1917) states that he sees one case on the upland farms to ten or twenty on the low marsh land—it is possible that this might be explained by the distribution of the midge (*Culicoides nubeculosus*).

The occurrence of the disease, particularly in farm horses, and its relative rarity in hunters and ponies might be explained by the association of farm horses with the farmyard *during the summer*, when the vectors are prevalent. The midges appear to be more or less confined to the immediate neighbourhood of their breeding places in the farmyard. Suitable breeding places do not appear to be common in the pastures and the only instance where the writer has suspected infection to have occurred at pasture was in three hunters turned out to grass for the summer—suitable breeding places were known to exist in their pastures (Cases 39, 40 and 44). Ponies are not commonly affected,

* In a Commonwealth of Australia (Advisory Council of Science and Industry) publication (1917) it is stated that the direct loss from worm nodules due to *Onchocerca gibsoni* to the State of Queensland alone was estimated at £500,000 per annum.

possibly for the same reason—absence from the breeding grounds of *Culicoides* during the summer; in all three cases recorded here in ponies the affected animals had been closely associated with the farmyard throughout the year and kept with the farm horses.

Another point of great interest is the seasonal incidence and period of incubation—a remarkable feature is the high proportion of cases commencing between January and June; for instance, 21 cases commenced in this period, while only eight are known to have started in the latter part of the year.

The period of incubation of the disease is difficult to determine, but if *Onchocerca* is of primary importance it is obvious that infection can only take place during the fly season. If one assumes that Cases 12 and 13 were both affected in the autumn of 1931 (August-September) the incubation period would appear to be between eight to ten months, and this would seem quite a probable period.

The fly season may extend from the middle of April to October; flies would only be infective after three weeks, so the infective period would probably be from about the middle of May till the first cold spell of winter has killed off the midges.

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[Two films, the first showing the manner of conducting the investigation, with process of collection of raw materials in the shape of the flies, and their favourite haunts; the other a micro-film showing the emergence of the parasitic worm from the head of the "midge" host, were then displayed—the latter was taken, at Cambidge, with Professor Buxton's micro-ciné apparatus.]

Discussion

The discussion on the foregoing paper was opened jointly by Professor T. B. Davie, Department of Pathology, University of Bristol (whose contribution was "not for publication") and Lieut.-Colonel E. P. Argyle, R.A.V.C. (retd.)

Lieut.-Colonel Argyle said he was delighted to have seen the two films before rising to open the discussion, because they gave the evidence for which Professor Davie had expressed a desire, and also showed the enormous amount of work and skill Mr. Steward had put into the production of the paper he had given them. They had also given the solution to two pieces of "thunder" he himself had prepared: two of his own projected questions had been answered.

Colonel Argyle referred to the nomenclature of poll-evil and fistulous withers, and other diseases, and traced how the present common names had arisen, explaining how they had originated from the expressions of the agricultural labourer who had, in these expressions, tried to convey what he had seen from the symptoms: he stressed the urgency now of introducing the correct nomenclature such as "nuchal disease" to cover "poll-evil and fistulous withers," and that the "frog" should be known as the "foot-pad." Commenting upon the fact that Mr. Steward had mentioned a female parasite as being 14 in. in length and 0·35 mm. in width, the speaker suggested the difficulty of having to express measurements in two different systems. Concerning the two schools of thought regarding etiology that Mr. Steward had mentioned, the specific and traumatic, he felt that their minds had been set at rest that the cause was generally specific, but there still lingered in the minds of many the fact that a traumatic cause was often prominent. Colonel Argyle recounted his experience under

Army conditions and confirmed the incidence of the disease where the climatic and insanitary conditions lead to the breeding of insect carrier pests; he suggested that a sore would prove a tempting place for the fly to deposit the parasite, which sore, being so minute, would hardly be looked upon as the chief cause of the trouble, the primary cause in many minds being associated with the injury. He would be doing Mr. Steward less than justice if he did not refer to the question of calcification, which he thought was first noticed by Dr. Lingard in 1896, in a horse suffering from a sore on the inside of the fetlock; though this development had not been deeply pursued until the present paper. Personally he had never found worms in the aorta, as reported by Dr. Lingard. This particular piece of work was worthy of a great deal more notice than it received in those days, and he would be remiss if he did not mention it.

Since his retirement he had become a student of economic entomology in a very simple capacity, purely to have something to do and to try to throw some light on things which had puzzled him, and he congratulated Mr. Steward on the way he had followed up the first and practically the underlying principle of the whole business, and that was to find the offending insect, identify it and diagnose it from the start. The next thing was not to be dismayed by the prospect of fatigue or temporary setbacks. The speaker was of opinion that the right way to tackle the problem was to exterminate the cause (the fly) by destroying its breeding places, and this could only be done by the expenditure of a vast amount of time and money.

He congratulated the essayist on the great volume of work he had put in—the examination of over 50 animals in ten counties, and not only the animals but often the surroundings. Mr. Steward had done a vast amount of dissection, and the microtomy was a very fine piece of work. Colonel Argyle referred to the varying incidence of outbreaks of insect pests, and thought the effects of the climate had a great bearing on the subject, particularly considering the very hot, dry summers of 1933 and 1934; the percentages being in 1932, 60 per cent.; 1933, 68 per cent. and 1934, 91 per cent. On these lines he was wondering what the percentage would be in 1935.

He had only two questions to ask: (1) At how many days' interval did the midges feed—ten or 25? (2) Must they feed on blood in order to produce fertile eggs?

In conclusion, he would venture to assert that this piece of work would make Mr. Steward's name one of renown; he was exceedingly proud that it should be done by a member of their profession. (Applause.) It was the kind of work in which they could give back to that profession something of what they owed to it: it raised them in the public estimation. He would prefer not to call it "research" but rather "seeking out for what is not known." One final word, in the investigations Mr. Steward must have made a practically complete survey, from the histological standpoint, of the horse's skin, and he thought he should be requested to publish a monograph on the subject: it would be of profound importance to those interested in surgery and sterilisation of the skin.

Mr. J. R. Barker said he felt particularly pleased that the son of one of the original members of their Association should be with them, taking such a leading part. He felt personal pleasure in being associated with him in the early stages of the investigation; he had shared some of the troubles, in the early days taking thousands of flies and getting no result, making them really down-hearted. But he also remembered the time when he (Mr. Steward) rang up to say that he had found a "sausage" in one of the flies. Mr. Barker noted the varying incidence of the diseases in a district where two rivers joined and made a triangle: inside that triangle one could go to the farms there and feel sure of finding cases of poll-evil or fistulous withers or both, bearing out what the speaker had said about the breeding places of the carrier flies. He remarked that since Mr. Steward's paper he had carried out less surgical interference than previously, treating the cases by other remedial measures. He was convinced that if Mr. Steward's paper was followed up in the right way, the eradication of the two diseases under discussion could be accomplished by the extermination of the flies and their breeding places; and until that had been done the introduction of a vermicide for injection would help to do away with the surgical cure at present commonly practised.

Dr. W. Scott extended his thanks to Mr. Steward for his excellent paper. It stood out as a monument of industry and earnest application: when one saw the finished article one was liable to forget the enormous amount of spadework and research required in cultivating unexplored virgin soil before the goal was reached.

He was not quite sure that he was in agreement with the essayist with regard to traumatism in the incidence of poll-evil and fistula of the withers; on the contrary, he was inclined to believe that local injury was the culminating factor, whether the condition be bacterial or helminthic and he would like to point out that it was not necessary for an animal to be worked for trauma to occur: he had treated many cases in young colts running at grass that had never had a collar on. The prominence of the poll and the withers lent those parts to injury when the animal rolled, for example. Again, horses young and old were given to rubbing heads and shoulders under trees, causing bruising. In support of those views he asked why it was that fistula of the ligamentum nuchæ half-way down the neck was seldom found.

Mr. Steward said the disease progressed from within, outward: what proof had he of this? The essayist had also added that there were in many cases no openings to the exterior. He (Mr. Scott) believed that an unabraded healthy skin was resistant to most bacterial infections, but when one remembered the heavy head bridles worn by cart-horses, the equally heavy collars, and the continuous perspiration under them, could it be wondered at that skin chafing was the rule, and was that not somewhat in line with the stiff

collar worn by man and sometimes a contributory cause of carbuncle?

He agreed that other factors must obtain and the most important was a lowered *opsonic* index. In practice one found, in the majority of those cases, that the patient was in a debilitated condition and it was his invariable practice to treat the debility by giving a course of arsenic and iron, and in addition, calcium and foods rich in calcium, for he held the view that there was a calcium deficiency as a first cause.

He agreed that the *Br. abortus* entered into the causation of those conditions, and more often than practitioners in this country thought; so also did streptococcus, staphlococcus and *B. coli*; in fact, in all "open" conditions the infection was a mixed one. Some years ago he made a series of investigations extending over two years, of horses which developed poll-evil and fistula, and in the large majority of cases he found a streptococcus in pure culture morphologically identical with the streptococcus of strangles.

If he judged aright, the question the essayist endeavoured to clarify was "is poll-evil and fistula bacterial or nematodal in origin?" A strong plea had been put up for the latter by the result of his investigations. But the presence of the worm did not mean that it was capable of producing all the clinical phenomena so well known and dreaded by the clinician, and if that was so, it should be ruled out as the *prima facie* factor. He thought all practitioners would agree that pronounced pus formation was the predominant factor in almost every case. But was the *nematode* capable by itself of producing pus? He thought not. In some cases one met an area in the centre of which one might find small foci containing thin sanious pus. In cases such as those he thought there was operative a kind of mitosis consequent upon some irritation and a low tryptic content of the pus. When one saw pronounced calcification deposits, he thought one was justified in ascribing this to a degenerate phase of the worm. One saw similar phases set up, for example, by the liver fluke in the liver, and the cysticercus in the muscle, but in none of those examples was true pus found. His experience was that in chronic cases nothing short of heroic radical surgery to remove the dead and dying tissues would answer; but that was not all, for to leave a debilitated body complex unchanged was courting a recurrence. There autogenous vaccination could do much good as a prophylactic by raising the *opsonic* index. In cases of advanced calcification his experience was that it was more economical to destroy the animal.

Mr. J. J. Aveston remarked, as an old friend of the family, that Mr. Steward's father would have been particularly proud to see the fine work his son had accomplished and recounted to them there that day, and he congratulated the essayist most heartily.

Mr. T. J. Brain expressed his high opinion of the essayist's endeavours, and remarked that in his practice he did not now operate for these diseases unless it was vitally necessary, as the very great difficulty was the question of drainage of the wound.

Mr. S. H. Pettifer inquired if the contention was that the worm was the sole cause of the disease, that the disease was due to injury by the worm, or to secondary bacteriological infection.

The President (Mr. T. J. Margarson) said the paper had been very well discussed, and added that the episode of the cheese waste killing the larvæ of the fly, the host of the worm, pointed in the direction of "prevention" of cause as being the way to eradicate the disease. He stressed the necessity for action in that direction, by telling farmers that if they emptied cheese waste over the breeding places they would have no fistulous withers. He asked Mr. Steward to reply to some of the questions raised.

The Reply

Mr. Steward commenced by thanking the joint openers of the discussion and the other speakers for the exceedingly kind reception they had accorded him.

In answer to Colonel Argyle, Mr. Steward said that trauma might exist as a cause of superficial suppurating conditions of these parts, and as suggested by Dr. Scott, it might possibly act as a culminating factor—although the fact that in most cases sinuses could be found leading to the ligamentum nuchæ suggested that the disease originated from within rather than from an external cause. Mr. Steward agreed with Colonel Argyle's view of the importance of field investigations—the whole of this work had been done in the field.

Colonel Argyle's calculations of the percentage of *Onchocerca* cases in the three years were most interesting and such figures over a period of years might be very valuable.

In answer to the questions about the midges, it did not seem likely that the vectors chose sores to deposit the infective larvæ but that infection occurred through normal skin, probably of the abdomen, as that was the favourite site of feeding of *C. nubeculosus*. The frequency of the midge's meals seemed to depend partly on atmospheric conditions and the accessibility of food. It seemed that the flies sometimes fed two or three or more times at intervals of six to ten days. A blood meal appeared to be necessary for the production of fertile eggs, though fertilisation frequently took place after hatching and before a meal was obtainable. With regard to the control of the equine parasite, it seemed quite reasonable to disregard *Simulium* as a possible vector and the fact that *Culicoides* was more or less confined to its breeding grounds should render control much easier. A further advantage was that, unlike protozoan diseases transmitted by insects, multiplication of the parasite did not take place in the insect.

Mr. Barker was thanked by the essayist both for his appreciation and comments on the paper and his assistance throughout the investigation.

In reply to Dr. Scott, Mr. Steward suggested that the worms alone were not responsible for the symptoms in complicated cases—secondary infection being responsible for these, and pus could be taken as an indication of secondary infection.

The importance of raising the resistance of the animal had been mentioned in the paper.

In answer to Mr. Brain's request for suggestions as to treatment, the essayist considered that interference was inadvisable with cases showing no sign of secondary infection; on the other hand, surgical interference was desirable as early as possible in infected cases. The best results seemed to follow the median incision operation, the technique of which was described in detail by Captain Brayley Reynolds (1920).

In referring to Mr. Pettifer's enquiry, Mr. Steward replied that the worm might be fully responsible for some cases and partly for others (where pyogenic infection occurred secondarily). Of this, however, there could be no positive proof until the disease had been set up experimentally by the transmission of the parasites; it was at one time hoped to attempt this, but unfortunately circumstances did not permit.

Clinical Communication

A SUGGESTED SURGICAL TREATMENT FOR HÆMATOMA OF THE EAR

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Members of the profession are well aware of the various surgical means at present adopted to deal with this common yet troublesome condition, but should any be desirous of giving a trial to a new method of surgical treatment, here is one which can be tried and which removes that element of uncertainty and annoyance occasionally associated with other methods of treatment. The technique is as follows:—

Place the patient on its side on the operating table, thoroughly clean the external ear and plug the orifice with sterile wool. Clip the hair from the part and render it aseptic. Anæsthetise the patient. Remove the blood and exudate by means of a large-sized hypodermic syringe or aspirator. Make eight circular holes (¼ in. diameter) through the skin on the inner side of the lobe of the ear. The holes should be uniformly distributed over the skin which has separated itself from the underlying tissues and must only penetrate the layer of skin on the inner side of the ear flap. The holes are made with ease. The flap of the ear is held firmly and by rotating a special punch, clean-cut circular pieces of skin are removed, while hæmorrhage is easily controlled. The secreting membrane is now removed through the perforations, the part irrigated with a mild antiseptic oil, and wadding and an ear cap applied. The wounds should be irrigated and dressed daily. It will be found that in the space of about two weeks' time the part has healed perfectly and there is rarely any thickening or deformity, nor does the condition recur.

By adopting this method of treatment drainage is perfect, the operation wounds do not appear unsightly, while since there are numerous small centres of cicatrisation, each counteracting the pull of the other, deformity is avoided.

Royal Sanitary Institute Congress, 1936

The Right Hon. Sir Kingsley Wood, M.P., Minister of Health, has consented to act as President of the Health Congress of the Royal Sanitary Institute, which is to be held at Southport from July 6th to 11th, 1936. He will deliver his Inaugural Address on Monday afternoon, July 6th. The deliberations of the Congress will be divided among seven sections, including sections of Preventive Medicine, Veterinary Hygiene, Hygiene of Food (in conjunction with the Food Group of the Society of Chemical Industry) and Tropical Hygiene.

Annotation

THE RELATIONSHIP OF CARCINOGENIC AND ŒSTROGENIC SUBSTANCES

It may be recalled that in 1915 it was definitely proved that the application of coal-tar to the ears of a rabbit is followed by cancer formation; this finding naturally led to a diligent search for chemical agents capable of causing cancer when applied to the skin or injected into the animal body and in this connection attention was gradually drawn to the importance of sterols and their derivatives, substances which are widely distributed in the animal and vegetable kingdoms. During recent years, this line of cancer research has received its greatest stimulus from the findings of Kennaway and his co-workers, who proved that the agents in coal-tar responsible for causing some forms of cancer are condensed ring hydrocarbons such as 1, 2-benzpyrene and 1, 2, 5, 6-dibenzanthracene, the general chemical nature of which is that of a sterol. They are thus related to substances which occur naturally in the animal body; in fact, a compound has been obtained from bile which possesses a molecular structure very similar to that of a carcinogenic agent obtained from coal-tar and, moreover, the workers mentioned above have been able not only to isolate carcinogenic hydrocarbons from coal-tar in a pure state but also to synthesise such substances from cholesterol.

During this phase of cancer research, biochemists and physiologists had also been studying the chemical composition and action of the sex hormones and when the female sex hormone, œstrin, had been isolated in a pure state and its chemical constitution ascertained, it was realised that it, too, is a condensed ring hydrocarbon related to the sterols. The œstrin molecule was found to be a partially hydrogenated phenanthrene ring system with a five membered ring fused on to it; it is therefore related to calciferol, ergosterol, neoergosterol, cholesterol, the bile acids and certain cardiac glucosides of polyterpene nature as well as to the carcinogenic hydrocarbons. It may be mentioned that all the sex hormones so far isolated in a pure state and also the "organisors" of Sepmann have shown themselves to be a group of closely related compounds which chemically are very similar to the substances mentioned above.

These chemical findings were naturally followed by an intensive study of the physiological actions of this large group of compounds and it soon became apparent that other substances besides œstrin could induce œstrus. A comparison between the molecular structure and

the physiological action of œstrus-producing substances has shown that their power to induce œstrus is due to the presence of oxygen in the phenanthrene ring, hence calciferol, ergosterol and active carcinogenic hydrocarbons possess the power of inducing œstrus. Conversely, it has been shown recently that daily applications of œstrin to the skin over the breasts of mice stimulate the epithelial structures in the breast and produce budding of the epithelium with an increase in the number of ducts and the formation of alveoli. Cystic dilatation of these ducts and sometimes round cell infiltration of the stroma follows until finally the ducts proliferate to such an extent that their appearance is suggestive of an intraduct carcinoma. It has also been established that the injection of œstrin into male mice is followed by the development of mammary carcinoma in about 50 per cent. of the subjects so treated even in non-cancer prone strains of mice. It must be mentioned, however, that the carcinoma thus produced takes some time to develop and that it does not develop in the normal immature breast but only in abnormal new breast tissue appearing as a response to œstrin. Evidence has also been obtained that agents capable of inducing œstrus are associated with mammary carcinoma in the human subject, for the injection into mice of fluid obtained from small cysts in the non-cancerous part of a breast removed from a woman produced œstrus in the experimental animals. An extract from the carcinomatous tissue from the same breast was, however, ineffective.

To recapitulate; there are chemical compounds present in the body which are related to cholesterol and the bile acids and which possess the properties of vitamins or hormones. They have a common phenanthrene nucleus in their molecule and so are related to substances not found in the body which possess carcinogenic properties and which are also capable of inducing œstrus. There thus appears to be a connection between carcinogenesis, certain phenomena of sex and vitamin D activity. The question now arises whether carcinogenic agents can be formed in the body from natural causes. It has been held that the evidence is insufficient to assume that they can arise from œstrin in the body or that intermediary processes occur between sterols, the bile acids and hormones. The most recent work, however, indicates that these opinions should be accepted with reserve, for it has been possible to convert cholesterol which exists in the body not only combined with fatty acids but also in a free and alcoholic form, into the male sex hormone, androsterone, which is a hydroxyketone closely related to the sterols. In the male, any excess of androsterone is metabolised into œstrin and excreted in the urine; in the female, œstrin is only excreted in the urine when not required for the proper functioning of the body. If for any reason the metabolism or excretion of these hormones is upset, the formation of carcinogenic agents in the body may follow.

The conclusions which may be drawn from the foregoing are that in the first place there is a far greater lack of specificity in the substances which induce œstrus and cancer than was at first thought and, secondly, that aberrations in the sterol metabolism may lead to tissue metaplasia. There is no doubt that the study of the sterol metabolism of the body will hold the attention of an increasing number of workers in the future. A search for the "cause" of cancer will doubtless also continue, and it is as well, therefore, to point out that the work so far accomplished has revealed many exciting causes of cancer and a single stimulus may produce different reactions under different circumstances.

J. A. N.

Abstracts

[**Canine Cystinuria. (An Unusual Case of Urinary Calculi in the Dog.)** Morris, M. L., Green, D. F., Dinkel, J. H., and Brand, E. (1935.) *N. Am. Vet.* **16.** 10. 16-19. 3 plates. (5 refs.)]

The authors describe a case of urethral obstruction by small calculi complicated by the presence in the bladder of a large calculus as well as several small calculi.

The patient was a four-year-old male Irish terrier presenting the clinical signs of urethral obstruction with a degree of toxæmia. Passage of a catheter was not possible owing to the obstruction of the urethra, but small quantities of sanguineous urine were being voided at frequent intervals.

Examination of a specimen of urine gave information that suggested the existence of a certain degree of cystitis. An unusual feature of the deposits was the presence of flat hexagonal crystals which the authors identified as cystine. They formed the opinion that the calculi in the urethra might possibly be composed of cystine. Examination of the blood indicated that renal function was not seriously impaired.

It was obviously desirable to endeavour to determine the condition of the bladder. No mention is made of the results of abdominal palpation either with, or without, a narcotic or anæsthetic, though it is presumed that such an examination was made. The state of the bladder was examined by X-ray, and a film obtained showing a well-defined image of a cystic calculus. (The film is reproduced.)

Under intravenous nembutal anæsthesia, urethrotomy and cystotomy were performed; the large single calculus removed from the bladder weighed 6·5 gm. A catheter was left in the urethra for the first few days after the operation; in three days the urine had become clear.

Chemical examination of the calculi showed that they consisted of about 95 per cent. of cystine and also contained a small amount of allantoin and some traces of phosphates.

The authors state that the urine of normal dogs contains 10 to 20 per cent. of the total sulphur content in an organic form; in this dog examination of a sample of urine obtained after the dog had recovered from the operation showed that the organic sulphur content represented 50 per cent. of the total sulphur content of that particular specimen of urine. They recovered from one specimen of urine passed by this dog 330 milligrammes of cystine per litre.

On the basis of the composition of the calculi and the high cystine content of the urine after recovery from the operation the authors concluded that the dog was suffering from cystinuria, a condition that they describe as a rare metabolic anomaly.

Though a few records exist of calculi removed after death having been proved to consist largely of cystine, the authors claim that this is the first case of cystinuria described in the living animal.

They discuss the possible ætiology of the condition and submit the hypothesis that this, like other inborn errors of metabolism, may be of an hereditary character. They propose to explore the genetic aspect of the problem.

G. F. B.

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[Respiratory and Vascular Changes in the Mammal before and after Birth. Barcroft, J. (1935.) *Lancet.* **229.** 5847. 647-652.]

The author draws his deductions from experiments carried out on pregnant sheep and goats, which were immersed in a warm saline bath and the fœtus exposed by means of Cæsarian section.

The fœtal circulation may be divided into that of the fœtus itself and that of the cord and placenta; the former contains one-half to three-quarters of the blood and the latter from one-quarter to one-half and there is reason to suppose that most of the blood from the placenta is withdrawn into the fœtus at birth. The placenta develops in advance of the fœtus and it follows, therefore, that in the earlier stages of pregnancy the placental circulation forms a large proportion of the fœtal vascular bed. The quantity of blood which irrigates the placenta is dependent not only on the size of its vascular bed but also on the pressure in the placental artery. Experiments have shown that in the last six weeks of pregnancy the arterial pressure nearly doubles but, even so, it remains low until birth. It was found that clamping the cord produced the first respiration and direct evidence was obtained that this is due to oxygen want. The first movement is always a gasp resembling the dying gasp of an animal deprived of oxygen. Clamping the cord also produced slowing of the heart which ensures a prolongation of its life and so the life of the fœtus should there be any difficulty in establishing respiration.

The blood which reaches the fœtal heart comes through the inferior vena cava from the placenta and lower part of the body and from the head and neck, and a study of the oxygen present in blood from various positions has shown that the blood arriving from the placenta passes to the head, arms, etc., and then passing through the heart again, goes up the ductus arteriosus or to the placenta. The liver receives blood direct from the placenta and so is able to maintain the metabolic activities of the fœtus at their optimum. The thickness of the ventricle walls is approximately the same on the right and left sides at birth; this indicates that the pressure in the right ventricle must fall after birth. This is brought about by the closure of the ductus arteriosus, which before birth is sufficient to carry away a third to a half of the blood leaving the heart. Histologically, this structure differs considerably from that of a normal artery but the mechanism of the closure of the ductus arteriosus remains to be investigated fully.

Oxygen passes from the maternal to the fœtal blood by a process of diffusion which is facilitated by the fact that fœtal hæmoglobin possesses a greater affinity for oxygen than does maternal hæmoglobin. In sheep, the fœtal hæmoglobin was found to disappear from the circulation at birth; this is probably accomplished by the fœtal hæmoglobin being broken down and reformed into the post-natal type. This change is necessary to ensure the adequate oxidation of the tissues after birth, since fœtal hæmoglobin does not yield its oxygen as readily as post-natal hæmoglobin. At this time considerably more oxygen is required than previously, since it has been found that the skeletal muscles of the fœtus are perfectly flaccid whereas tone and so the need for more oxygen develops as soon as the fœtus is exposed to the outer air.

J. A. N.

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[Aspergillosis of Wild Turkeys Reared in Captivity. Durant, A. J., and Tucker, C. M. (1935.) *J. Amer. Vet. Med. Ass.* **86.** 6. 781-784.]

This article records the occurrence of a serious epizoötic among wild turkey poults,

reared under artificial conditions, which was attributed to Aspergillosis originating from an infected commercial mash.

The disease appeared at five days of age, mortality reached its maximum at about 15 days and subsided at three to four weeks. From a total of 785 poults hatched, less than 200 survived.

Post-mortem examination of three age groups revealed infection of the lungs and adjacent air-sacs in all. In the older poults (three to four weeks) the lesions in the lungs were apparently chronic—small, yellowish-white nodules varying in size from minute points to nodules 6 to 8 mm. long and 3 to 5 mm. in diameter. In five- to ten-day-old poults the lesions were acute, the lungs dark red, congested and stippled with minute nodules.

Cultures from congested lung tissue on acidified potato dextrose agar yielded an Aspergillus identified as *A. fumigatus* Fres. Samples of the commercial mash which had been in use proved to be heavily infected with *A. fumigatus*.

Feeding experiments were carried out on chicks (poults being unavailable), but were inconclusive.

R. F. G.

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[**The Transmission of Fowl Leukosis with Desiccated Blood.** Stubbs, E. L. (1935.) *J. Amer. Vet. Med. Ass.* **86.** 6. 721-725.]

Blood from a fowl affected with typical erythroleucosis was dried from the frozen state *in vacuo* over phosphorus pentoxide, sealed in test tubes and stored in the refrigerator. Transmission experiments were carried out at various intervals from 2 to 932 days after desiccation and chickens became affected with typical leucosis in all groups except one. The percentage number of chickens affected in a group varied from 33·3 to 66·6.

These experiments indicate that the causal agent of transmissible leucosis of chickens can be preserved by desiccation and retains its activity in the dry state for at least 932 days.

R. F. G.

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[**The Physiology of the Cæcum of the Domestic Fowl.** Olson, C., jun., and Mann, F. C. (1935.) *J. Amer. Vet. Med. Ass.* **87.** 2. 151-159.]

The authors have studied the *p*H of the cæcal contents and compared them with the *p*H of other portions of the gastro-intestinal tract from 42 chickens fed on standard diets. The rate of filling and emptying of the cæca was also determined by mixing dyes with the food. The food containing the dye was fed for 24 to 48 hours and then the animals were given food without dye and killed at varying intervals afterwards.

The type of diet appeared to exercise little effect on the *p*H of the gastro-intestinal tract, which varied between 4·06 in the gizzard and 7·59 in the ileum. The *p*H of the cæca was found to be lower than that of the preceding or succeeding portions of the intestine. Certain of the dyes used in the experiments could be detected in the cæca 24 to 48 hours after they had been ingested and the cæca were found to empty themselves in about 120 hours. It appeared that certain substances used to colour the food, *e.g.*, lamp black, did not enter the cæca in any appreciable amount.

J. A. N.

Report

THE PRESERVATION OF GRASS AND OTHER FODDER CROPS*

Much attention has recently been concentrated upon artificially dried grass by press writers and others in lay papers; exaggerated statements and extravagant claims have been made and it is satisfying to be able to read an authentic report in which the case is set forth reasonably and logically in clear language. The Report presently under review serves to correct many of the loose and inaccurate statements which have been made. The general impression one forms upon reading it is that much information has already been obtained and much is known of the principles of drying grass by artificial means, but much still remains to be done before the practice of artificial drying can become generally incorporated into agricultural practice.

The Report concerns itself, in the first place, with a review of the existing methods of preservation of fodder crops. Current methods of haymaking, tower, stack, pit and trench ensilage are reviewed. It is stated that haymaking, as practised, is a very wasteful process in which losses of some 25 per cent. occur, costing annually about £5½ millions, and that even well-made hay is of comparatively low feeding quality. The loss is chiefly in starch equivalent, protein and carotene, the precursor of vitamin A. Investigations have shown that grass cut young (5 to 8 in. high) dried by hot air or other gases, compressed and stored, retains practically unimpaired the qualities it possessed as fresh grass. Due precautions are necessary. Special methods of growing, cutting, collecting and drying are required, and when the problems these present have each been solved, it is claimed that something not far short of a revolution

* Committee Report: Agricultural Research Council Report Series, No. 1. Published by H.M. Stationery Office, 1935. Price 1s.

in grassland farming may result. The value of the production of dry matter per acre could be roughly doubled, and much of the presently unavoidable loss from inclement weather in bad hay seasons would be avoided. Figures are given in which it is shown that by calculating the money value per ton by the methods adopted by the Departmental Committee on Rationing of Dairy Cows, dried young grass from monthly cuttings has a Starch Equivalent of 60, Protein Equivalent 12, and a food value per ton of £5 15s.; very good hay has values as follows: S. E. 40, P. E., 7·8 and is worth £3 16s. per ton; while poor quality hay gives an S.E. of only 19; a P.E. of 2·9; and a value of £1 16s. per ton.

The yield per acre of dried grass varies greatly. In dry seasons it may be as low as 1·8 tons per acre (four weekly cuttings), while in favourable years with proper manuring and management it has reached 5½ tons per acre. The average yield to expect seems to be about 3 tons per acre, especially under the moister, milder conditions which obtain generally on the western side of Britain.

Cuttings take place at either four weekly or five weekly intervals according to growth—each cutting taking place when the young grass blades are about 5 to 8 in. high, or in the June-July period when there is a greater tendency to stem-formation, at 3 to 5 in. In the process of drying, the water content of the crop is reduced to about 10 per cent., and a total loss in weight of about 75 per cent. occurs. This means that for a dried grass yield of 3 tons per acre a total green crop of some 12 tons per acre must be handled. The labour involved still presents difficulties but with the application of special grass-cutting and collecting machinery these may soon be overcome.

The Report contains a series of conclusions and suggestions which, summarised, are as follows:—

(i) A successful system for the preservation of young grass and other similar crops would be of great value to British Agriculture.

(ii) The best conditions for large scale production are where a moderately high rainfall occurs on good land capable of growing good pasture evenly through the summer. Small scale plants could be operated under a wider range of local conditions.

(iii) The cost of producing sufficient green grass to yield 1 ton of dried grass would normally be about £2.

(iv) At current prices of other foodstuffs the value of the dried grass would be about £6 10s. per ton, irrespective of any value (which may be considerable) accruing from colour (carotene content), vitamin or mineral content.

(v) Further experiments in different areas are needed to determine gross output of dry matter per acre, seasonal distribution, and best manurial and cultural treatment.

(vi) A cheap small-scale grass drier would be a boon to many grassland farmers.

A technical discussion of the details of some of the mechanical driers at present manufactured is incorporated. These are probably of least interest to the veterinary surgeon. He will be more concerned with the feeding value of the product and a comparison between it and other foods. Beyond a mention that experiments are in progress at the Hannah Dairy Research Institute on the comparative nutritive qualities of young dried grass grown in spring and autumn, there is no such information available in the present Report. It is to be hoped that a second Report giving full details of the use of dried grass in practice, and of its particular suitability for this or that class of stock, will be published later as a sequence to the first Report.

W. C. M.

Review

[O. Charnock Bradley: **"Topographical Anatomy of the Dog."** 3rd Edition. Published by Oliver and Boyd. Edinburgh.]

That a third edition of this work should have become necessary is, in itself, sufficient testimony to its usefulness and value to the veterinary profession. The whole text has been revised, certain parts re-written, and new matter added to the extent of 17 pages, whilst there are 11 new illustrations. It is pleasing to note that the figures throughout are a great improvement over those in the earlier editions, especially as regards their clarity and detail. The extended use of multi-colours contributes in no small degree towards this end. In view of the dearth of literature upon anatomy of the dog it appears to us a great pity that the work under review should have been restricted to the soft tissues.

One can find no fault with it as a Topographical Anatomy, or dissection manual, but the author would have fulfilled a dire need had he included the skeleton. In these days of greyhound racing, large numbers of canine practitioners are daily confronted by skeletal injuries, many of which necessitate X-ray photography. The reading of radiographs would be considerably facilitated if reference could be made to a reliable treatise on osteology. May we venture to hope that Dr. Bradley will one day provide such a volume? The publishers of the 3rd edition of "Topographical Anatomy of the Dog" have maintained the excellence of their work, as the quality of paper, the binding and clarity of print leave nothing to be desired.

Colonial Reports

DEPARTMENT OF VETERINARY SCIENCE AND ANIMAL HUSBANDRY, TANGANYIKA TERRITORY

Report of the Director (H. E. Hornby), 1934

The Veterinary Service is greatly handicapped by adverse tellurgic influences and widespread tsetse belts. Areas that contain abundant grazing are so highly infested with tsetse flies and ticks that animals cannot live within them, while the relatively healthy areas within which the cattle population is forced to subsist are so arid that over-stocking and starvation are inevitable. Disease control under such circumstances is, obviously, extremely difficult. These conditions are described as follows: "Six-ninths of the territory is tsetse-infested and cattle-free. About one-ninth is so arid that it is comparatively disease-free and stocked to saturation, the numbers being regulated by deaths from starvation. About two-ninths are free from tsetse owing to altitude and the open nature of the country, and yet are under-stocked owing principally to enzoötic East Coast fever causing a more than 50 per cent. mortality among calves."

The work of the Department is described under five headings, *viz.*: Disease Control; Research; Measures to bring about better distribution of Stock; Hides, Skins and Ghee; Demonstration Farms. It is not possible in the space available to review all these activities here. The report, which extends to 130 pages, is full of interesting data for our colonial colleagues and should be consulted in the original.

The following is a brief review of the section dealing with disease control:—

Rinderpest.—Two major outbreaks and several minor ones of this disease occurred during the year and involved several thousand animals. The illicit movement of cattle and the migrations of infected game were the principal causes of this conflagration. Quarantine and double inoculation of the in-contacts were the measures adopted for suppression and the results were highly satisfactory. It was noticed that the disease contracted from game was extremely mild though the game themselves were dying of it.

Contagious Bovine Pleuropneumonia.—Probably less than 2,000 animals died of this disease during the year and its control is well in hand. Infected herds are quarantined and where possible vaccinated.

East Coast Fever.—This disease and starvation are the two great causes of mortality in the over-stocked areas. The disease is dealt with where possible by dipping.

Trypanosomiasis.—With six-ninths of the territory infested with tsetse flies it becomes obvious how large a problem this disease presents. The advantages of land reclamation as a practical measure of reducing or confining infested zones are pointed out.

Anthrax and Blackquarter.—These diseases were reported from every province of the territory, but the outbreaks were not extensive.

Foot-and-Mouth Disease.—The disease is mild and is always simmering somewhere in the territory. Game become affected.

Tuberculosis.—The incidence of this disease in cattle is extremely low, while it is a serious menace to the human population. Cornell, the research officer, found that cattle sharing the same sleeping huts as their infected owners do not contract the disease, as indicated by the tuberculin test.

Heartwater.—A survey of the distribution of this disease is being made. While native sheep seem to live with impunity in infected areas, a flock of pure-bred Merino sheep exposed in one of them was wiped out by the disease, while a cross-bred Romney Marsh-native flock appeared to have a high resistance, since only four out of 20 exposed died of the disease.

Bovine Contagious Abortion.—This disease appears to have no general economic significance in native-owned herds and is of importance at present only to progressive farmers endeavouring to build up good herds of dairy cows.

Red-water and Anaplasmosis.—Practically all native cattle contract red-water during calfhood and become premune. Anaplasmosis has many features in common. Outbreaks are dealt with as they arise.

Other cattle diseases encountered in the territory and dealt with in the report are: *Ephemeral fever of cattle, worm infestations, plant poisonings, ophthalmia, skin diseases* (*mange* and *streptothricosis*), and *diseases of equines, pigs, poultry and dogs.*

Even from this brief review it will be apparent that Mr. Hornby and his far too small a staff are faced with a tremendous task to cope with these various infectious diseases, irrespective of the other duties which devolve upon them.

W. K.

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VETERINARY DEPARTMENT, UGANDA

Report for 1934

This report, covering 35 pages and illustrated by two maps, describes so fully the year's work of the Veterinary Department in Uganda that

it is impossible to do more than refer briefly to a few of the more outstanding points. In a publication such as the *Record*, which deals with all branches of the profession, it is, of course, impossible to allot more than a limited space to any report. It must, however, be regretted that there is no other means of bringing to the notice of those at home details of the work and conditions in our dependencies. Such information would, it is thought, induce interest and encouragement.

Disease control goes on with its usual variations. Rinderpest still causes considerable anxiety. Virus and serum immunisation is practised and the involved animals are quarantined. The difficulty of maintaining quarantine may be judged by the statement that the disease appears amongst buffalo, warthog, eland and bushpig—animals which are beyond all control. Success depends upon rapid action whenever an outbreak is discovered. In one case, no less than 4,000 head were inoculated in four days, a truly remarkable performance when the smallness of the staff and the difficult conditions are taken into account.

Trypanosomiasis continues to be of economic importance and is spread to clean cattle by mechanical transmission, by straying animals and those of visiting owners. Inadequate herding also plays its part. The efficiency of the new Bayer product, "Surfen C," is now being investigated. The concentration of herds, for rinderpest inoculation, is often followed by outbreaks of anthrax. In one instance, a mortality of 60 in a herd of 400 head followed their movement to a convenient centre. Tuberculosis is practically confined to one province; foot-and-mouth disease is of little economic importance; pleuropneumonia has, fortunately, caused little worry, but tick-borne diseases, especially East Coast fever, are liable to cause considerable mortality.

Native educational work continues. By classes for native schoolmasters, demonstrations and lectures at stock centres, mission schools and other institutions, efforts are made to instil the principles of cattle-mastership amongst those who may be called upon to influence others. During the year, no fewer than 86,190 "scrub" male animals have been castrated. Of these, 70,555 were bulls. The elimination of these undesirable animals from the breeding herds must be followed by a noticeable increase in the quality of succeeding generations and a general raising of the standard. As the policy progresses, accompanied, as it is, by the culling of poor cows, a really good stamp of acclimatised cattle should result and become the foundation stock for grading up by crossing when improvement in conditions and pasturage render such progress desirable. Two schemes, initiated and supervised by the department, are of the greatest, and immediate, economic importance. The first is the guidance which is being given to Africans in the proper methods of skinning carcases and treating the hides. In former times the waste was very great; to-day the value of exported hides is steadily increasing. The second scheme, that of organising meat and milk supply, is of still greater importance and is also a valuable factor as an incentive to improved cattle-mastership. Available cattle from outlying districts are gradually being led to centres where a demand exists, may be anticipated, or created. The steady and constant supply is, undoubtedly, tending to create demands amongst those who, previously, were not meat eaters. Thousands of cattle for which no market previously existed have been disposed of. A commencement in meat inspection has been made. All this must, in time, have an influence upon the health and physique of the natives, as well as upon the revenue of the colony.

Some relaxation from the rush of serum production has enabled the research staff to devote greater time to investigations of the many problems which confront those engaged in all branches of the work.

Completely inadequate as is this review, it may serve to give some idea of the wide scope of the work which is so capably being carried on in Uganda.

J. S.

UNIVERSITY OF LONDON ANIMAL WELFARE SOCIETY

The ninth annual report of the University of London Animal Welfare Society, 42, Torrington Square, W.C.1, just published, is a record of considerable extension of activities. The following items are worthy of special note.

The work of arousing interest amongst the students of the University of London has been very much expanded and the branches in colleges of this university have large student membership. The Society has led an intensive campaign against the gin trap. The second reading of the Gin Traps (Prohibition) Bill was defeated last May in the House of Lords by only four votes. In this connection the Society has promoted the humane fumigation method of rabbit-control principally favoured by Australian experts.

Volume III of the Animal Year Book was published last June and has been received with enthusiasm as a work reaching a very high standard.

Many interesting connections have been made with universities and individuals abroad.

The only note of regret in the report is struck in the announcement under finance. During the year under review the expenditure has considerably exceeded the receipts and unless the work of extension on which the Society has entered is to be curtailed, an increase of contributions must be secured.

N.V.M.A. Divisional Reports

EASTERN COUNTIES VETERINARY MEDICAL ASSOCIATION*

MEETING AT CAMBRIDGE

The autumn meeting of the above Association was held at the Institute of Animal Pathology, Cambridge, at the kind invitation of Professor J. B. Buxton, and attracted what must have been a record attendance.

Before the meeting the members congregated in one of the rooms of the laboratory, where various pathological specimens were on view, which proved of great interest to all, especially some freshly dissected fowls, exhibiting lesions of fowl paralysis.

The President, Major W. Wortley, was in the chair. There were also present:—

Members.—Captain H. R. Allen, Captain A. J. Beeson, Mr. F. Blakemore, Captain D. Blyth, Captain T. J. Bosworth, Mr. M. Bray, Mr. W. J. Browning, Professor J. B. Buxton, Mr. W. H. Dennett, Mr. R. E. Glover, Major F. Leeds Gooch, Major T. G. Heatley, Captain S. E. Hill, Messrs. D. S. Jack, G. H. Leader, W. F. Loveless, and G. T. Matthews, Captain F. W. Medlock, Mr. C. T. Murphy, Mr. C. C. Nesling, Captain N. F. Pollock, Captain E. Brayley Reynolds, Captain W. Shipley, Mr. R. Burgess Smith, Captain J. F. Thurston, Captain W. K. Townson, Captain P. R. Turner, Captain W. Waters, Mr. P. J. Welch, Colonel W. A. Wood and the Hon. Secretary.

Visitors.—Lieut.-Colonel T. E. Burridge, Mr. F. W. Leeds Gooch, Major H. E. Keylock, Mr. A. Millar, Mr. Ramsay Millar, Lieut.-Colonel P. J. Simpson, Major C. W. Townsend, Mr. R. W. A. Watchorn and Mr. R. P. Webber.

The minutes of the last meeting, as published in *The Veterinary Record*, were taken as read and signed.

Correspondence: (1) From the following, regretting their inability to attend: Messrs. H. Buckingham, J. Buckingham, J. L. Buckingham and E. Burgon, Lieut.-Colonel A. Castle, Mr. B. Claxton, Sir F. Hobday, Messrs. W. F. Howes, A. Millar, J. Reid, H. Swann and W. Turtill.

2. From the N.V.M.A., enclosing a report of the Association's Committee on Fur-Bearing Animals.

3. From the N.V.M.A., intimating that for the purpose of appointing representatives to the Council, N.V.M.A., only those members of a Division who are also members of the N.V.M.A. should be taken into account in determining the number of representatives allowed. Enclosed with this letter was a list of members of this Society who did not belong to the "National."

4. From the N.V.M.A., enclosing the rules governing the award of the Dalrymple-Champneys' Prize.

Annual Meeting.—It was decided to hold the Annual General Meeting at Norwich, in January, 1936.

Bovine Tuberculosis: Observations by Mr. Glover

(1) Protection of Calves by B C G Vaccine

In view of a wish expressed by several members of the Association, a short talk was given by Mr. Glover on the recent investigations at the Institute on the protection of calves against tuberculosis by B C G vaccine, together with some remarks on tuberculin testing.

Dealing with the vaccination of cattle, Mr. Glover said that during the past six years a series of experiments had been undertaken under the direction of Professor Buxton and Dr. Griffith which were concerned with two problems of importance, *viz.*, the harmlessness and the immunising value of B C G. Since the inception of the investigation 97 calves had been injected with doses varying from 5 mg. to 100 mg. by different routes, but mainly by intravenous injection. All these animals had been carefully autopsied, but in no case had any lesions of tuberculosis been found which could have been attributed to the vaccine. In the series of immunity experiments, the first step was the determination of the most favourable method of administering the vaccine and the most satisfactory dose. To this end protected calves were tested by the intravenous inoculation of small doses of living cultures. The result showed that of 34 calves vaccinated by various routes, all except one showed some increased resistance. In most cases the length of life was considerably prolonged and the lesions were considerably less extensive than in the controls. The administration of the test dose by the intravenous route was particularly severe, but it served its purpose in that it permitted the subcutaneous, intratracheal and other methods of inoculating the vaccine to be compared. The conclusion was reached that the intravenous method of giving the vaccine gave the most satisfactory results.

The next step was to inoculate the test dose by a less severe route and one more resembling a natural infection. The actual exposure of groups of vaccinated and control animals to infection by contact with open cases of disease, as has been undertaken by other workers, is (said Mr. Glover) unreliable, since certain animals may acquire an excessive infection while others escape more lightly. It was therefore decided to feed each animal under experiment with a known amount of culture in a

* Received for publication December 11th, 1935.

single dose. In the first series of this group six calves were vaccinated by the double intravenous method (5 mg. and 100 mg. of B C G) with an interval of three weeks between the doses and were tested orally three months later with virulent culture. At *post-mortem* examination, the six vaccinated calves were completely protected while the two controls were affected with moderately severe alimentary tuberculosis. These results, indicating a complete immunity after three months, were most encouraging and led to a second and larger series of experiments in which the duration of the immunity was tested over a longer period and the effects of attempting to reinforce a waning immunity by a second vaccinating dose were studied. In the first group there were 21 vaccinated animals which were divided into four lots and were tested three, six, nine and twelve months respectively, after immunisation, together with eight controls. It was found that the immunity at three months was absolute, at six and nine months showed some slight diminution and at twelve months was definitely on the decline. In the revaccination experiments comprising 13 vaccinated and six control animals a definite increased resistance was noted in animals reimmunised six, nine and twelve months after a primary vaccination.

This was the end point in this series of experiments. At the present moment observations are being made on the resistance of vaccinated animals to exposure to repeated infection over a period of several years.

(2) The Tuberculin Test

Mr. Glover then passed on to a discussion of the tuberculin test. He said that there was no reason to doubt the validity of intradermal tests undertaken with "old tuberculin," but pointed out that since this product contained a large amount of non-specific protein, the negative reaction in a small number of non-tuberculous animals might assume somewhat large proportions. With a view to reducing the degree of non-specific reaction a series of experiments had been undertaken with tuberculins prepared in synthetic media from which the tuberculin protein had been precipitated by saturation with ammonium sulphate. By this means it was possible to prepare a comparatively pure solution of the active principle which, when injected into negative cattle, induced little or no reaction.

When using "old tuberculin" in tuberculous cattle, it was necessary to recognise a non-specific reaction, induced by the constituents of the medium itself, on which was imposed the œdematous response due to the tuberculin protein. With precipitated synthetic medium tuberculin, the whole of the reaction was attributable to the specific substance. Under these circumstances, the actual increase in the skin measurements in a tuberculous animal injected with synthetic medium tuberculin might be slightly less than with "old tuberculin," but the characteristic diffuseness was equally apparent with the two products when the swellings were inspected and lightly palpated. The value of synthetic medium tuberculins as compared with old tuberculin could be assessed only by injecting a large series of cattle simultaneously with the two preparations, determining the average mean increase in the skin measurements (*i.e.*, the difference in millimetres between the skin measurements at the initial and final readings) and comparing the figures thus obtained in positive and negative animals. When this was done, it was found that synthetic medium tuberculins were as potent as "old tuberculin" in tuberculous animals, but had the additional advantage that they provoked a far less intense negative reaction in unaffected cattle. These conclusions were illustrated by a chart showing the results of comparative field trials with "O.T." and synthetic medium tuberculins.

[The publications on Vaccination with B C G and on Tuberculin Testing, to which reference was made in the address, have been abstracted in *The Veterinary Record*. (1934.) **14.** 347; **15.** 583.]

The members then had an opportunity of inspecting demonstration animals which had been injected with old tuberculin and with synthetic medium tuberculin. The differences in the types of reactions were pointed out and numerous questions were answered. In addition, the calves under experiment with B C G vaccine were shown and interesting observations on the course of injection in protected and control animals respectively, with particular reference to tuberculin tests, were discussed.

Post-mortem Specimens.—Captain S. E. Hill exhibited a hair ball which was picked up by a cowman on a meadow which had been grazed by both cattle and horses, none of which had been noticed to be ill. The specimen was about the size of a cricket ball.

Mr. G. H. Leader exhibited the mesenteric artery of a thoroughbred yearling, showing the result of infestation by *Strongylus vulgare*, which was interesting on account of the large numbers of adult parasites to be seen. Practically every branch of the artery was choked with them and Mr. Leader mentioned that it was very rare, in his experience, to see so many parasites in the artery and its branches.

Captain E. Brayley Reynolds showed a specimen of various parts of the intestine and mesenteric glands of a yearling thoroughbred colt. These were left at the laboratories for examination and will be reported upon at the next meeting.

The members were then entertained to tea by Professor Buxton. A hearty vote of thanks to Professor Buxton and his staff for such an interesting meeting and their hospitality was proposed by Captain E. Brayley Reynolds, seconded by the President, and carried with applause.

Professor Buxton, in reply, said they at Cambridge were very pleased indeed to entertain the Association. His one regret was that they did not come more often, but on the other hand, they felt honoured by the size of the attendance.

After tea, Mr. Glover answered numerous questions raised by members with reference to the B C G vaccine. A most successful meeting concluded with a hearty vote of thanks to the President for his conduct in the chair.

H. P. Standley, jun., *Hon. Secretary.*

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MID-WEST VETERINARY MEDICAL ASSOCIATION*

MEETING AT BRISTOL

A General Meeting of the Mid-West Division was held at the Canynge Hall of the Bristol University, on Friday, May 17th, 1935, under the Chairmanship of the President, Mr. T. J. Margarson, M.R.C.V.S. (Stroud), supported by the following members: Messrs. W. A. Austin, J. J. Aveston, J. R. Barker, J. B. Baxter, T. J. Brain, S. Codrington, A. E. Gachet, J. S. Garside, S. V. Golledge, F. B. Hardy, F. C. Hobbs, D. W. Menzies, S. H. Pettifer, J. B. Powell, A. S. Roberts, B. Sayer, W. Scott, E. E. Seldon, W. R. Watson, H. C. Wilkins and C. E. Perry (Hon. Secretary).

The following were present as visitors: Messrs. C. S. Adams, E. P. Argyle, E. C. Bovett, M. L. Dartnall, T. B. Davie, G. G. McLaren and J. S. Steward.

The minutes of the last meeting, which had been previously printed and circulated, were taken as read and agreed as correct.

Apologies for absence were read from Sir Frederick Hobday, who congratulated Mr. Steward on the excellent and original pioneer work he had done on the subject dealt with in the paper to be presented by him to the Division that afternoon, and Messrs. Howard Jones, Hudson, Eardley, Urquhart, Renfrew, Coleman and Rees.

The President congratulated Mr. Charles E. Perry (Hon. Secretary) on his appointment as Chairman of the Mangotsfield Urban District Council, and mentioned that the position automatically carried with it a seat on the Bench. He also congratulated the District on their appointment. Mr. Perry suitably replied.

Correspondence. — A letter from the "National" was read regarding a suggestion for a composite fee payable instead of separate subscriptions, and asking for the views of the Division. This was left to the Council for consideration and action.

Another letter from the "National" regarding Veterinary Advisory Officers, and dealing with agricultural research, was similarly delegated to the Council.

Paper.—The Chairman then asked Mr. Steward to introduce what Professor Hobday had described, quite rightly, as a very brilliant piece of work, as recounted in his paper "Fistulous Withers and Poll-Evil," now to be presented.

[A printed copy of the paper had been circulated beforehand to each member; the paper is reproduced, together with the report of the discussion upon it, at the commencement of this issue of the *Record.—Editor.*]

Mr. Steward who was warmly received, said he proposed to show the stages of the life cycle and biology of the condition by illustrating them on the screen with photographs projected by epidiascope, and subsequently to show two films, explaining in detail how the work was carried out with an experimental horse, and the emergence of the infective larvæ from the head of the fly host. The latter film was taken with Professor Buxton's micro-ciné camera.

The epidiascope photographs were projected and explained by Mr. Steward individually.

Votes of Thanks.—Following the discussion the Chairman said it was obvious that Mr. Steward had done a tremendous lot of work and he wished to emphasise one point particularly, and that was how honoured the "Mid-West" felt that he should present his paper to them. As the time was late he hoped they would show this appreciation heartily. The motion was carried with acclamation.

Mr. Perry thanked Professor Davie for opening the discussion, also Colonel Argyle who, when approached, consented most readily to follow. This vote of thanks was also carried with applause.

A very hearty vote of thanks to the University of Bristol for the kindness shown in placing the hall and all its facilities at the disposal of the Association was proposed by Mr. Perry and seconded by Mr. Barker, who said that he had for some years thought they ought to be in closer relationship with the University, and was very glad they had made so pleasing a commencement.

A vote of thanks to the Chairman concluded the proceedings.

C. E. Perry, *Hon. Secretary.*

* The long delay which has taken place in the publication of this report is regretted, but it was not received for insertion until November 25th.—*Editor.*

National Veterinary Medical Association of Great Britain and Ireland

Annual Congress at Scarborough—September 14th to 18th, 1936

Schedule of Accommodation at Hotels and Boarding Houses

Name and situation of hotel or boarding-house.	Charges for bed and breakfast.		Weekly charges for bed and breakfast.		Inclusive charges.				Whether garage at hotel—if not, situation of nearest garage.	Available bedroom accommodation.	
					Per day.		Per week.				
	Single room.	Double room.	Single room.	Double room.	Single room.	Double room.	Single room.	Double room.		Single rooms.	Double rooms.
Parade Private Hotel, Esplanade	6/6	12/-					3½ gns.	7 gns.	No. Nearest 1 minute away	7	8
Spa Private Hotel, St. Nicholas' Cliff	6/6	13/-			10/-	20/-	3 gns.	6 gns.	No. Nearest 100 yds. away	20	40
Prince of Wales Boarding House, 28, Prince of Wales Ter.	6/6	13/-					3½ gns.	£7	No. Nearest at back of hotel	10	20
Grosvenor Private Hotel, South Cliff			50/-	4 gns.			3½ gns.	6 gns.	Yes — for 11 cars. Nearest garage 3 mins. away	14	54
"Breece," West St., South Cliff	7/-	12/- 14/- twin beds					3½ gns.	133/- 3½ gns. each, twin beds	No. Nearest 200 yards away	10	25 (9 with twin beds)
"Rivelyn" Private Hotel, Crown Crescent, South Cliff	7/-	12/-			11/6	21/-			Yes — for 6 cars	6	14
Sefton Private Hotel, Prince of Wales Terrace, South Cliff	7/6	15/-			10/6 to 11/6	21/- to 23/-			No. Nearest a few yards away	3	33 Passenger lift to all bedrooms
Fairview Hotel, South Cliff	7/6	13/-	52/6	91/-	11/- to 13/-	20/- to 25/-			Yes—2 lock-up garages & very large garage 150 yds. away	21	35
Denisholme Private Hotel, South Cliff	7/6	12/6					4 gns.	7 gns. to 8 gns.	No. 3 garages near	2	9
Clifton Hotel, North Bay	7/6	14/-					4 gns.	£8	No. Garage adjoins hotel	20	40
Zylpha Hotel, South Cliff	7/6	14/-					3½ gns.	6 gns.	Yes — a small one—a very large garage opposite	50	40
"Carisbrooke" Central Private Hotel, The Crescent	7/6	13/-					3½ gns.	7 gns.	Own car park	10	24
St. Nicholas' Private Hotel	7/6 to 8/6	15/- to 17/-			21/- to 25/-	21/- to 25/-			No. Nearest 100yds. away	45	50
Rowntree's Villa Esplanade, South Cliff	8/-	15/-	55/-	5 gns.					No. Nearest 2 mins. away	15	30
Silverdale Private Hotel, Esplanade	8/-	16/-					4 gns.	7 gns. to 10 gns.	No. Nearest at back of hotel	6	14
Hotel Montrosa, South Cliff.	8/6	17/-					From 87/6	From 8 gns.	No. Three within 150 yards	6	14
Allfield Private Hotel, Prince of Wales Gardens, South Cliff	8/6	17/-			12/6 to 15/-	25/- to 30/-			No. Nearest 1 min. away	4	16
Wessex Private Hotel, Esplanade, Sth. Cliff	8/6	17/-					From 4 gns.	From 8 gns.	No. Nearest 1 min. away	20	26
Esplanade Private Hotel, South Cliff	From 8/6	From 17/-					From 4 gns.	From 8 gns.	Largest garage in Scarborough, within 100 yds. of entrance	20	60

Name and situation of hotel or boarding-house.	Charges for bed and breakfast.		Weekly charges for bed and breakfast.		Inclusive charges.				Whether garage at hotel —if not, situation of nearest garage.	Available bedroom accommodation.	
					Per day.		Per week.				
	Single room.	Double room.	Single room.	Double room.	Single room.	Double room.	Single room.	Double room.		Single rooms.	Double rooms.
St. Alma Private Hotel, West Street, South Cliff	8/6	17/-			10/6	21/-	3 gns.	6 gns.	Yes — public garages also next door	8	30
Weston Private Hotel, Esplanade, Sth. Cliff	8/6	17/-			12/6	25/-			No. Garage accommodation within 3 mins. of hotel	4	16
Brooklands Hotel, South Cliff	8/6	17/-			10/6	21/-			No. Public garage at rear of hotel	21	30
Argyll Private Hotel, Esplanade, Sth. Cliff	8/6	17/-					87/6	£8 15s. to gns.	No. Nearest 1 min. away	2	12
Grand Hotel	8/6 to 10/6	17/- to 21/-			16/- to 25/-	32/- to 50/-			No. Nearest 2 mins. away	100	200
Hazeldene Private Hotel, 48, Esplanade, South Cliff					From 10/6	From 21/-			No. Public garage 3 mins. away	2	15
Waldorf Hotel, Esplanade					From 10/- to 13/6	From 20/- to 27/-	70/- to 94/6	£7 to 9 gns.	No. Nearest 2 min.'s walk from hotel	10	20
Prince of Wales Hotel	10/6	21/- 25/- private bath					7 gns.	14 gns.	No. Nearest 1 minute from hotel	70	50
Cambridge Hotel, South Cliff	10/6	21/-							Yes, for 4 cars Lock-up gar. 2/- per night Several near	15	30
Holbeck Hall Hotel, Seacliffe Road	10/6	21/-					From 5 gns. to 7 gns.	From 10 gns. to 14 gns.	Yes	16	16
Pavilion Hotel	From 10/6	From 21/-					From 5 gns. to 9 gns.	From 10 gns. to 18 gns.	Yes	50	50
Royal Hotel	10/6	21/-					From 5 gns. to 8 gns.	From 10 gns. to 16 gns.	No. 3 public garages in close proximity	100	95
Uplands Private Hotel, Prince of Wales Terrace, South Cliff					10/6 to 14/-	21/- to 28/-			No. Good garage within 100 yds.	8	16
Hotel Granville, Esplanade	12/- to 16/6	24/- to 33/-							No. Public garage at rear of hotel	18	30
Manor Private Hotel					12/- to 15/-	24/- to 30/-			No. Nearest 150 yards from hotel		
Ramsdale Private Hotel, South Cliff							5 gns. and £5 15s.	10 gns. and £11 10s.	Yes	11	18
Red Lea	14/- to 18/-	28/- to 36/-							No. Nearest 3 mins from hotel		
Queen's Hotel					14/- to 21/-	28/- to 42/-			No. Outside parking for 40 cars in hotel grounds	38	50
Crown Hotel	14/6	29/-			21/6 to 25/6	43/- to 51/-			No. Public garage directly at rear of hotel	20	20

The positions of the above-mentioned hotels can be ascertained from a map published in the Scarborough Handbook, copies of which can be obtained post free from the Publicity Manager, Town Hall, Scarborough.

AS THE PERIOD OF THE CONGRESS COMES WITHIN THE "BUSY SEASON," EARLY BOOKING OF ACCOMMODATION IS ESSENTIAL.

ROYAL COLLEGE OF VETERINARY SURGEONS

Membership Examination, December, 1935

LIST OF SUCCESSFUL CANDIDATES

(*Continued from page* 1555.)

Edinburgh

FIVE YEARS' COURSE

1st Examination

*Britton, A. F. F.
Carus, J. G.
Christie, G. J.
Coleman, J. G.
Douglas, J. F.
Drummond, D. J.
Grant, J. A.
Hartley, W.
Hathorn, D. S.
Irvine, R. E.
Leitch, J. M. F. (C)
McCrea, Robert (B)
Mackinnon, I. J.
Murray, E. G.
Shanks, T.
Smith, N. C.
Turner, A. L.
Wilkins, J. H.

* Denotes 2nd Class Honours.

(C) Denotes credit in Chemistry and Physics.

(B) Denotes credit in Biology.

2nd Examination

Adams, J. A.
Blanshard, Wm.
Carmichael, M. A.
Christie, D.
Crooks, S. J.
Gibson, T. G. E. (P) (H)
Jack, A. (P)
Jagger, F.
Lawson, J.
Luxmoore, H. B. (H)
McLaren, J. J.
Milne, A. H (P) (H)
Newhouse, J. (P)
Parry, H. B.
Renwick, C. C.
Taylor, A.
Twizell, C. W.
Walker, R. B.
Watson, R.
Wilson, J. G.
Ziffo, G. S.

(P) Denotes credit in Physiology (including Biochemistry.

(H) Denotes credit in Histology and Embryology.

3rd Examination

Byrne, F. A. (H)
Grussell, C. S.
Mahamooth, T. M. Z., (P) (A)

(P) Denotes credit in Pharmacology.

(A) Denotes credit in Anatomy.

(H) Denotes credit in Hygiene, etc.

FOUR YEARS' COURSE

Class C

Baker, Wm.
Drummond, J.
Fernie, Peter
Jobson, K. M.
Matheson, R. C.
Morris, L. T.
Morris, P. G. D.
Muir, R. O.
Potts, J. P. A.
Robertson, L. F.
Slinger, F. R.
Smith, J. K.
Watson, W. J. B. (H)

(H) Denotes credit in Hygiene, etc.

Class D

Bannister, P.
Coates, J. A. R.
Crawford, M. E.
Ferguson, H. N.
Foggie, A.
Harbour, H. E.
Jack, J. D. M.
Keith, N. W.
Laing, A. D. M. G.
Macleod, A. W.
Macleod, Murdo
Macpherson, D. J.
Milne, J.
Munro, R. B. T.
Ritchie, A. F.
Senior, V. E.
Serebrisky, B.
Wright, J.

Liverpool

FIVE YEARS' COURSE

1st Examination

Davies, D. B.
Hall, J. D.
Lewis, G. D.
Jones, Ivor
Morse, Miss M. D. R.
Pugh, R. J.
Tarver, W. J.

2nd Examination

Cassar, A. (H)
Docker, T. M.
Dransfield, J. W.
France, W. H.

(H) Denotes credit in Histology and Embryology.

3rd Examination

Bonallo, T. G. (A)
Kerruish, B. M.

(A) Denotes credit in Anatomy.

FOUR YEARS' COURSE

Class B

Johnston, R. W.

Class C

Chappel, C. N.
Holroyd, H.
Young, S. C.

Class D

Court, P. R.
Cubby, J.
Datnow, Miss R.
Henderson, Miss R. M.
McDonald, A. M.
Morton, Miss D. R.
O'Neill, P. A. F.
Roberts, D. T.
Thompson, Miss P. E.
Wallis, Miss C. S. Ransome
Wilson, Miss G. M. K.
Wilson, W.

London

FIVE YEARS' COURSE

1st Examination

Blackler, P. M. B.
Canti, J. A.
James, G. R.
Pass, N.
Spriggs, D. N.
True, A. J.

2nd Examination

Allen, G. S.
Ballard, Miss I. C.
Berger, J. (P) (H)
Biddis, K. J.

(P) Denotes credit in Physiology (including Biochemistry).

(H) Denotes credit in Histology and Embryology.

London (*contd.*)

Bugg, R. R.	Littlewood, H. K.
Bunker, J. A.	Mead, N. St. C.
Comyn, R. B.	Morgan, D. G.
Dayus, E. H.	Morgan, K. U.
Drake, V. A.	Owen, D. W.
Edwards, F. V.	Piercy, S. E. (H)
Good, F. D. T.	Roach, R. W.
Gray, W. van O.	Roberts, Miss D. M. P.
Green, R. A.	Sagredo, Miss M. I. M.
Harrop, A. E.	Wilson, C. D. (Glasgow)

(H) Denotes credit in Histology and Embryology.

3rd Examination

Bishop, W. H.	Isherwood, A. D. A.
Cooke, R. G. T.	James, J. P. (A)
Ellis, A. A. B.	Llewellin-Evans, T. G.
Ellis, J. H.	Robertson, Mrs. H. M.
Harries, D. C.	Smith, F. W. A.
Green, A. R.	*Spratling, F. R.
Hiles, H. J.	Walpole, R. O. W.
Humm, R. L.	

* Denotes 2nd Class Honours.
(A) Denotes credit in Anatomy.

FOUR YEARS' COURSE

Class C

Austin, F. J.	Kirk, D.
Buxton, J. C.	Luckham, H. de C.
Craddock, Miss D. H.	Mehra, G. K.
Hart, A. W.	Pasfield, J. A. (H)
Kapur, J. D.	Thomas, D. K.

(H) Denotes credit in Veterinary Hygiene.

Class D

Ahmad, M. M.	Lamb, E. G.
Andrewes, F. N.	Lower, Miss S. F.
Frost, Ian	McCubbin, W. J.
Haegler, Miss J. C. V.	Morant, Miss K. M.
Hickman, Miss A. V.	Richardson, D.
Hickman, Miss V. C. N.	Silverman, Miss M. R.
Hutton, Miss B. A.	Slade, Miss A. B.
John, F. V.	Turnbull, J. E.
Kellas, H. N.	Wylie, R. L.
Knott, G. K. L.	

COLOUR CHANGE IN ANIMALS

With the assistance of Professor Hogben, F.R.S., the London Zoo has arranged an exhibition designed to illustrate the way in which certain animals are able to change their colours to tone with their surroundings. The exhibition, which is situated in the lobby of the Reptile House, will be continued for several weeks. In it animals such as chameleons, frogs of various species, and sea-water flat-fish are displayed in duplicate, one tank or cage being white-painted and brightly illuminated, the other being dull black. The animals in the light cages have either turned very pale or they are displaying their full colours, while those in gloomy surroundings are dark and inconspicuous.

In Parliament

Prior to the Christmas Recess, the following questions and answers were recorded in the House of Commons:—

ANIMAL CLINICS

Mr. CREECH JONES asked the Home Secretary the number of local authorities that have clinics where domestic or other animals are treated for diseases or injuries and where they can be humanely destroyed when necessary; whether local authorities contribute money annually towards the upkeep of such clinics in England, Wales or Scotland; whether any local authorities provide in the police stations in their areas any proper provision for the treatment of unwanted or strayed domestic animals as well as for their destruction; and what are the usual means employed by police officers for the humane destruction of such animals?

Sir J. SIMON: I can reply to this question only so far as it relates to the police in England and Wales. They would not attempt to treat injured or diseased animals, but would call in a veterinary surgeon when necessary, or convey the animal to some institution where it could be properly treated. As regards destruction, some police forces have a lethal chamber, but more generally they have standing arrangements with a local veterinary surgeon or dogs' home to undertake destruction in a suitable manner.

. . . . .

RACECOURSE BETTING CONTROL BOARD

Mr. HALL-CAINE asked the Home Secretary whether, before approving the recent grant from the Racecourse Betting Control Board for the assistance of horse-breeding during 1936, he took any steps to ascertain whether the grant in question would be so distributed as to benefit all types of horse-breeding in Great Britain; and whether it will be possible to arrange for any supplementary grant during 1936 to assist those sections of horse-breeding which will not benefit by the £5,000 granted to the Hunters' Improvement Society?

Mr. LLOYD: The grant of £5,000 was approved for the specific purpose of awarding premiums for thoroughbred stallions in 1936. As regards further grants for other sections of horse-breeding the board have informed me that they will bear this question in mind when preparing schemes for the application of money from the Totalisator Fund.

. . . . .

HORSES (IMPORTS)

Mr. PERKINS asked the Minister of Agriculture whether he will state the approximate number of horses imported from foreign countries during the eleven months of 1935 and for a similar period of 1934?

Dr. BURGIN: The following table shows the total number of horses (including ponies) imported into the United Kingdom and registered during the first eleven months of 1934 and 1935 as consigned from foreign countries.

Horses (including ponies):—

Description.	January to November.	
	1934.	1935.
Stallions	167	195
Mares	615	943
Geldings	1,211	3,756
Total ...	1,993	4,894

Horses (Export)

Wing-Commander James asked the Minister of Agriculture whether, in order to prevent the exploitation of the animal-loving public, he will issue a statement as to the conditions under which horses are exported, showing the numbers and classes of animals exported, the countries of their destination, and the approximate numbers exported for slaughter on arrival, during the past three years?

The Minister of Agriculture (Mr. Elliot): The position regarding the export of horses from this country is that no horse may be shipped unless, after examination at the port of shipment by a Veterinary Inspector of the Ministry, it has been certified by him as fit to travel and to work without suffering. This regulation is strictly enforced, and a high standard of fitness is required in respect of every horse exported. The horses are well fed and cared for both before and during the sea voyage. I do not propose to issue any special statement on the subject, but I am sending my hon. and gallant Friend the statistical information referred to in the latter part of his question.

Wing-Commander James asked the Minister of Agriculture the quantity of horseflesh exported, with its destination, during the past three years?

Mr. Elliot: I am circulating in the *Official Report* a statement giving the information desired by my hon. and gallant Friend in respect of the years 1932-1934. Figures for 1935 are not yet available.

Following is the statement:—

Year	Belgium	France	Holland	Total
	Carcases	Carcases	Carcases	Carcases
1932 ...	21,329	355	427	22,111
1933 ...	26,050	76	122	26,248
1934 ...	23,926	3	128	24,057

Note.—The figures are supplied by the Governments of the importing countries concerned. There are no exports of horseflesh except to the above-mentioned countries.

Wing-Commander James asked the Minister of Agriculture whether he has any information as to the conditions under which horses are slaughtered in Holland, Belgium and France; and whether there are any grounds for supposing that any horses of British origin were exported for slaughter in the last two named countries during 1934 or during the first six months of 1935?

Mr. Elliot: The use of the humane killer is compulsory in all centres in Holland, and in France at Boulogne, Calais and Vaugirard, the principal slaughtering establishment in Paris. In Belgium, I understand that the humane killer is in general use, though other methods may be used under permit. During 1934 and up to June 30th, 1935, 326 horses were exported from this country to Belgium and 633 to France. None of these were reported as shipped for slaughter.

. . . . .

Horses in Mines

Mr. Ritson asked the Secretary for Mines, whether he is aware that certain colliery companies are requiring horsekeepers in their employ to be responsible for more than the number of horses and ponies under their charge according to the limits of the Coal Mines Regulation Act, 1911, Sections 86 and 109, and Third Schedule, paragraph 4; and whether it is his intention to have the Act carried out as stated in the above-named Sections?

Captain Crookshank: I have made inquiries and none of the divisional inspectors know of any recent instance of a failure to comply with Clause 4 of the Third Schedule of the Coal Mines Act, 1911. If the hon. Member will let me have the information on which his question is based, I will make further inquiries.

. . . . .

Horse Transport (Restrictions)

Mr. Turton asked the Minister of Transport under what statutory authority he proposes to limit the use of horse transport in British towns other than London; and whether, in view of the anxiety caused by the prospect that horse transport is to be discouraged in the principal provincial cities, he will take an early opportunity of clarifying his policy in this direction?

Mr. Hore-Belisha: While I cannot admit the assumptions contained in my hon. Friend's question, the relevant statutory authority is contained in Section 46 of the Road Traffic Act, 1930, as amended by Section 29 of the Road and Rail Traffic Act, 1933, which empowers highway authorities to take action subject to the confirmation of the Minister. A statement of my policy in this matter will be found in the answer which I gave on December 5th to my hon. and gallant Friend the Member for Ayr Burghs (Lieut.-Colonel Moore), of which I am sending my hon. Friend a copy.

Mr. Turton: Are we to understand that what the Minister told us last July, that he proposed, with modifications, to stop the use of horse traffic on the roads in five years, is not correct?

Mr. Hore-Belisha: What I said last July and what I said in December are exactly the same. If my hon. Friend will read what I said, he will find a complete statement of my policy.

. . . . .

Poisons Board (Recommendations)

Mr. Hall-Caine asked the Secretary of State for the Home Department when regulations are likely to be introduced to bring into effect the recent recommendations of the Poisons Board; and whether such regulations will vary in any way these recommendations?

The Secretary of State for the Home Department (Sir John Simon): The Poisons List and Rules will be issued at the end of the present month (December). There are certain differences from the original recommendations, but the modifications have been decided upon after consultation with the board.

. . . . .

Milk Reorganisation Commission

Captain McEwen asked the Secretary of State for Scotland whether, in view of the delay in the publication of the Milk Reorganisation Commission's report, it will be possible, in the interests of milk producers generally, to arrange for the publication of an interim report?

Sir G. Collins: As the matters under examination raise wide issues of policy common to both England and Scotland, the commission do not consider it practicable to make a report until they have reached their final conclusion. With that view I agree. In these circumstances it will not be possible to arrange for the issue of an interim report.

. . . . .

Living Animals (Experiments)

Mr. Groves asked the Home Secretary whether electric immobilisation or injection of starch grains into the carotid artery are held as complying with the provisions as to anæsthetics under the Act 39 and 40 Vic., c. 77, relating to experiments on animals; whether he is aware

that these respective methods are in use for the purpose of producing anæsthesia in experiments on animals; and whether there are any specific regulations laid down in connection with the granting of licences for such experimentation as to what does, or does not, constitute an anæsthetic within the meaning of the Act?

Mr. Lloyd: I am advised that electric immobilisation and the injection of starch grains into the carotid artery are effective methods of causing complete insensibility in animals, but they are never used in the laboratories as substitutes for the recognised anæsthetics. There are no specific regulations defining anæsthetics and there is no definition in the Act, but there is attached to every Certificate B (the certificate permitting cutting operations with subsequent recovery) a condition requiring that the anæsthetic administered must be of sufficient power to prevent the animal feeling pain.

Mr. Groves asked the Home Secretary whether he will state the reason for the delay in issuing the Return of Experiments on Living Animals for 1934, which was presented to the House and ordered to be printed on July 30th, 1935, but was not issued and publicly available until the latter part of September?

Mr. Lloyd: I regret the delay in the issue of the Return for 1934 which was due mainly to the prolonged absence following an accident of the Clerk responsible for the preparation of the tables and the figures in the introductory statement. The addition to the list of registered places of the information as to ownership asked for by the hon. Member on April 29th, 1935, necessitated an examination of the files relating to registered places, which further delayed the preparation of the Return.

Mr. Groves asked the Home Secretary whether there is any regulation as to the age at which a licence to experiment on animals, under the Act 39 and 40 Vic., c. 77, may first be held; and, if so, what is this limit?

Mr. Lloyd: No regulation as to age has been laid down, but a licence would only be granted on the recommendation of the scientific authorities named in Section 11 of the Act and provided the Secretary of State is satisfied as to the fitness of the applicant to hold a licence.

Notes and News

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events

1936

Jan. 2nd.—Meeting of the Central Division, N.V.M.A., at the Conway Hall, Red Lion Square, W.C., 6.30 p.m.

Jan. 6th.—N.V.M.A. Committee Meetings.

Jan. 7th.—N.V.M.A. Council and Committee Meetings.

Jan. 8th.—R.C.V.S. Committee Meetings. V.V.B.F. Council Meeting.

Jan. 9th.—R.C.V.S. Committee Meetings.

Jan. 10th.—R.C.V.S. Committee and Council Meetings.

Jan. 13th.—Meeting of the Editorial Committee, **N.V.M.A., at 2, Verulam Buildings, Gray's Inn, W.C.1, at 4 p.m.**

Jan. 17th.—Ladies' Guild Dance in aid of the Victoria Veterinary Benevolent Fund, Princes' Galleries, Piccadilly, W.

Sept. 14th-18th.—N.V.M.A. Annual Congress, Scarborough.

* * * * *

PERSONAL

Lady Hobday

It is with the greatest regret that we have to inform our readers that Lady Hobday's condition shows no improvement and continues to give rise to the gravest anxiety. Our last issue contained the sad announcement, which has called forth universal expressions of sympathy for Lady and Sir Frederick Hobday and their family, that Lady Hobday was knocked down by a motor-car in Kensington and sustained serious head injuries.

. . . . .

We are glad to state that Mr. J. K. Bateman, B.Sc., M.R.C.V.S., of Northaw, Herts., who, as recorded last week, sustained a fractured skull as the result of a motor accident while on a visit to the north of England, is now out of danger.

. . . . .

Mr. D. Brown, M.R.C.V.S., of Oban, has been appointed interim veterinary surgeon to Argyll County Council, in succession to Mr. John MacDougall, M.R.C.V.S., who, as reported in our last issue, has retired after 60 years' service.

* * * * *

GENERAL OBITUARY

Captain H. E. Hobbs

We regret to record the death, at the early age of 39 years, of Captain Horace Edwin Hobbs, who was well known to the profession through his achievement, in 1931, of raising the sum of £20,000 for the re-building of the Canine Department of the Royal Veterinary College and the foundation of a Professorship of Canine Medicine and Surgery. Captain Hobbs was the founder and organiser of the Tail-Waggers' Club, which has for its object the promotion of the welfare of dogs, and the rights and interests of dog owners. This reached a membership of nearly a quarter of a million in a little over a year, and in 1930 three limited companies were formed "to inaugurate, conduct, and control Tail-Waggers' Clubs in any part of the world." To-day its membership numbers 660,000. He also devised a scheme of purchasing dog licences by weekly instalments of 2d., and over 20,000 licences were taken out by this method this year. Only a few weeks ago he launched an appeal to members of the Tail-Waggers' Club for funds for the Guide Dogs for the Blind Association, of which he was honorary treasurer, for the training of Alsatians to lead blind people in the streets. It has already been highly successful.

* * * * *

LIVERPOOL EXAMINATION LIST

The following is the University of Liverpool, School of Veterinary Science, Examination List

for December, 1935, in connection with the University Degree of B.V.Sc.:—

NEW REGULATIONS

SECOND EXAMINATION: Cassar, A., Dransfield, J. W. Firth, T. B., France, W. H., Furber, T. R., Hancock, J. L., Tardrew, J. H., Williams, R. E., Wood, R. B. Passed in Individual Subject—Kennedy, G. Y. (Physiology).

THIRD EXAMINATION: *Part I.*—Bonallo, T. G., Jones, S., Kieran, H., Shirley, G. N., Tutton, E. A. *Part II.*—Bonallo, T. G., Tutton, E. A. *Part III.*—Bonallo, T. G.

OLD REGULATIONS

FINAL EXAMINATION: *Part I.*—O'Neill, P. A. F., 1. 2. Ormerod, Miriam R. *Part II.*—3. Ormerod, Miriam R.

THIRD EXAMINATION: *Part I.*—Needham, A. J. E., Young, S. C. *Part II.*—Needham, A. J. E., Young, S. C. *Part III.*—Needham, A. J. E.

1.=Distinction in Veterinary Medicine.

2.=Distinction in Veterinary Surgery (including Obstetrics).

3.=Distinction in Toxicology and Jurisprudence.

* * * * *

FOOT-AND-MOUTH DISEASE IN WALES

An outbreak of foot-and-mouth disease among cattle at a farm near Gowerton, Glamorgan, was confirmed on Sunday last. A standstill order covering a 15-mile radius, which includes the whole of the Gower Peninsula and Swansea, has been issued, prohibiting the movement of livestock except by licence.

* * * * *

FIVE CALVES AT A BIRTH

Captain K. A. Miles, M.R.C.V.S., of Market Harborough, writes: "I attended a calving case last week, and assisted at the birth of five calves. The cow was a pure-bred Welsh, and her five calves were born dead, and a month before normal time. They weighed 178 lb., three being females and two males. The mother made an uneventful recovery."

* * * * *

EXAMINATIONS EXAMINED: A DISTURBING DOCUMENT

Examinations as "stepping-stones to higher things" play so important a part in our educational and even our social systems that any serious suggestion made by authority in support of the rejected student's invariable contention that examinations may be unreliable as a test of knowledge in certain instances, must be viewed with apprehension.

In our recognition of the increasing intensity of the struggle for existence—put bluntly, the competition for jobs—our sympathies with the younger generation have for some time manifested themselves in an anxiety to ascertain how far the element of chance enters into the results of our public examinations. As an outcome of an International Conference on Examinations, held at Eastbourne in 1931, committees were set up in various countries and the main work of the English committee, which comprises distinguished professors of education and psychology, is being recorded in a volume entitled "The Marks of Examiners," now in course of printing. The principal results of their investigation, however, are shown in summary form in a recently issued pamphlet.*

It is true that this "Examination of Examinations," the publication of which has now supplied proof in support of the opinions of those who hold that the examination system has many defects, concerns itself solely with examinations associated with the academic calendar, but in the minds of members of the veterinary and other professions there must arise the uneasy thought, is it to be supposed that the human element, the all too variable intrusion of which is so clearly revealed in this document, is any more dependable among our examiners than among those for the School Certificate Examination, for example?

The committee's report, in fact, though not in word, poses the problem, how may objective standards of merit, independent of the vagaries of individual examiners, be ensured? The examples given of what we may term the "caprice of individual judgment" are astounding. To quote but one, one of the most interesting of the twelve separate investigations is that on School Certificate History. Fifteen scripts which had originally been awarded the same mark—a "middling" mark—by the authority concerned were marked independently by 15 examiners. The marks ranged from 21 to 70. The original examiners thought the scripts of equal merit; the committee's examiners didn't. They disagreed with their predecessors, and they disagreed among themseives. Worse than this: each examiner disagreed with himself. For after an interval of a twelve-month the same scripts, with changed identification numbers, were marked again by 14 out of the 15 examiners (one being unable to serve again), and on this second occasion the marks ranged from 16 to 71. And not only did the examiners give different marks the second time, but they changed their minds as to the verdict of Pass, Fail and Credit in 92 cases out of a total of 210.

Particularly interesting, too, is the research into the Viva Voce Examination for the Home Civil Service. Two boards of examiners interviewed independently 16 candidates. The candidate whom Board A placed first on the list was placed 13th by Board B, and the candidate whom Board B placed first was placed 11th by Board A. In no case was there complete agreement.

Such discrepancies become the more disturbing when it is revealed that the examiners employed were the actual examiners engaged in that particular kind of work; the scripts were the actual scripts written at the actual examinations; the conditions under which the examiners marked the scripts were the same as those under which they were originally marked. Moreover, the examiners were paid the usual fees and worked in a way which was calculated to secure, not less agreement than usual, but more. For they had fewer papers to mark, they were less pressed for time, and—an important consideration—they knew that they were working under experimental conditions and that the results would be subjected to careful analysis and criticism.

The upshot of the whole inquiry is the creation of a widespread conviction that the results of public examinations as at present conducted are highly precarious. However much care is taken to secure uniformity in the marking of scripts (and it is admitted that the utmost care is actually taken) there is always a disturbing lack of unanimity in the final verdicts.

And yet . . . and yet . . . we are relieved to think that the report conveys no suggestion that it would be as well to abolish examinations—the committee definitely think not—relieved

* International Institute Examinations Enquiry. An Examination of Examinations by Sir Philip Hartog, K.B.E., C.I.E., and E. C. Rhodes, D.Sc. London: Macmillan and Co., Ltd. 1935. 1s.

because, while the "rough and ready" justice they dispense may be altogether too rough on certain examinees (which defect the system should be amended to remove) we have a vivid recollection of the type of student who would rejoice the most were cry ever to echo round our colleges "No more examinations!"

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HEDGEHOGS AND THE COMMON COLD

The Lancet of December 7th calls attention to the fact that the search continues for an experimental animal susceptible to the common cold. "Human volunteers and chimpanzees, while definitely susceptible, cannot be used to solve most of the major problems of the disease," says *The Lancet*, and continues: "Interest attaches, therefore, to a preliminary communication made by Mr. J. T. Edwards, D.Sc., to the meeting of the section of comparative medicine of the Royal Society of Medicine held at the Lister Institute on November 27th. Observations on foot-and-mouth disease formed the starting-point of his studies; the virus of this disease will infect hedgehogs by the intranasal route and causes in them a high mortality. As the virus is passed in series, the rôle of secondary invaders, such as pasteurella, salmonella, and particularly *Bacillus bronchisepticus*, becomes more prominent. The virus, in fact, activates the normal nasal flora of the hedgehog and this may lead to the animal's death from bronchopneumonia or septicæmia. "It was possible," argued Edwards, "that if material derived from cases of common cold contained a filtrable virus, this virus might in a similar way be found to prepare a way for certain subpathogenic bacteria on the nasal mucosa of the hedgehog to obtain a foothold, multiply, and set up catarrhal lesions." Filtered and unfiltered secretions from three cases of acute coryza in man were inoculated into hedgehogs under ether anæsthesia, and Edwards reports that a number of animals showed an increase in their nasal discharge after inoculation, and that in some of them catarrhal lesions were found histologically in the mucosa covering their turbinates. *B. bronchisepticus* was the organism most commonly recovered from affected hedgehogs. Broth and "heated cold filtrate" did not produce comparable effects. Passage in hedgehogs was apparently successful for three serial transfers.

"At the same meeting Dr. C. H. Stuart-Harris said that in consultation with Dr. Edwards he had been carrying out similar experiments at the National Institute for Medical Research at Hampstead. He was able to confirm the fact that hedgehogs inoculated intranasally with common-cold secretions develop an increased nasal discharge. He hesitated, however, to conclude at this stage that the effect was a specific one, for three reasons. First, normal hedgehogs show great variation in the amount of their nasal secretions; secondly, he had suggestive evidence that inoculation of *B. bronchisepticus* alone could increase the amount of secretion; and, thirdly, he had been unable to correlate the amount of discharge with the histological findings.

"This line of approach to the common cold is an interesting one, but the interpretation of the results must be much more difficult than in most work on viruses, for variation in the nasal flora of hedgehogs is a factor very difficult to control. The results must therefore be regarded with great caution, indicating at most that further work along these lines is desirable. It may be added that as Edwards has failed to infect ferrets and mice, the virus, if virus there is, is probably distinct from that of influenza."

H.M. STATIONERY OFFICE PUBLICATIONS

The undermentioned have been published recently. Copies can be purchased through any bookseller, or directly from H.M. Stationery Office, at the following addresses: London: Adastral House, Kingsway, W.C.2, and 28, Abingdon Street, S.W.1; Cardiff: 1, St. Andrew's Crescent; Manchester: York Street; Edinburgh: 120, George Street.

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SWINE FEVER ITEMS

Prosecutions.—A fine of £80, with costs, was inflicted on Clayton E. J. Rice, a 30-year-old farmer, of Newport, by the Newport Borough Bench, for failing to report a suspected case of swine fever in respect of 16 pigs. Police Inspector H. Randall drew attention to the seriousness of the case, stating that persons neglecting to report suspected cases were likely to cause the spread of the disease through a large district. The aggravating thing about it was that Rice knew what was required. Only last year, swine fever had broken out on his premises. "In all my experience I have never known such a case," added the Inspector.

A veterinary inspector said that the defendant told him that one sow had been dead for three or four days, two had been dead for ten days, and seven pigs' carcases in a passage had been there for about two weeks. A further search of the premises revealed part of the carcase of a three-months-old store pig, by the side of a rick. Next morning, witness made *post-mortem* examinations as far as was possible with such decomposed carcases, and seven showed obvious signs of advanced swine fever. This was later confirmed, by the Ministry, at their Weybridge laboratory. The pigs in the sties had apparently been dead not less than a month, and in view of their terrible decomposition witness would say that Rice was quite inaccurate in saying that some of the animals had been dead only a few days.

. . . . .

A Taunton firm of wholesale butchers, who were recently fined £50 and costs at Cullompton Police Court for failure to notify the existence or suspected existence of swine fever at their farm at Clayhidon, were fined a further

£25 at Taunton County Petty Sessions, for an alleged similar offence in connection with their slaughterhouse at Bishop's Hull, Taunton.

* * * * *

Outbreak at Somerset Farm Institute.—At a recent meeting of the Somerset Agricultural Sub-Committee, Mr. Hay, the County Agricultural Organiser, reported that an outbreak of swine fever occurred at the Somerset Farm Institute, Cannington, and was confirmed on November 24th. All the pigs had been examined and 23 had been killed and buried. Of the rest, 132 were sent for slaughter, and 13 of these were condemned at Smithfield Market. There were now about a 100 pigs on the farm, all of which had been inoculated. Since then there had been no further trouble. They had no idea of the source of the outbreak. It might have been introduced by foxes, a number of which had been seen on the farm at night. Starlings, or rats might have been the cause. Their bacon contracts had had to be cancelled.

In reply to a question, Mr. Hay said there was no compensation for the loss of the pigs.

Mr. J. F. Broughton explained that some years ago the Government compensated farmers for losses, but the practice had to be stopped as it became too costly and was abused in some directions.

It was agreed to refer the matter to the Diseases of Animals Sub-Committee.

The Chairman of the Committee, Mr. C. Harden, remarked that there was a great deal of swine fever in the country at the present time. He thought it would be useless to recommend that the compensation scheme be re-introduced.

Mr. Broughton, remarking that it was a very serious matter, said "You are never going to get farmers to report outbreaks of swine fever unless they are going to be paid. They would rather take the risk and not report them."

SIXTH INTERNATIONAL CONGRESS OF GENETICS

At the Sixth International Congress of Genetics held at Ithaca, New York, 1932, a Permanent International Committee of Congresses of Genetics was elected consisting of representatives of 15 different countries, and Professor Otto L. Mohr, professor of medicine in the University of Oslo, was elected chairman. This committee has accepted the invitation of the Academy of Sciences of the U.S.S.R. to hold the Seventh International Congress in Moscow and Leningrad in 1937. The date of the Congress will be decided upon later. It may be mentioned that in 1937 an All-Union Agricultural Exhibition will be held in Moscow, which undoubtedly will prove of great interest to many members of the International Congress on Genetics.

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EGGS AND POULTRY

The Report of the Reorganisation Commission for Eggs and Poultry for Great Britain (Economic Series No. 43, price 1s. net or 1s. 2d. post free), has recently been published as one of the series of Orange Books on Agricultural Marketing.

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Forthcoming "Southern Counties" Meeting at Winchester.—In connection with the next meeting of the Southern Counties Division, N.V.M.A., which is to be held at the Royal Hotel, Winchester, in mid-January, Captain J. F. D. Tutt, of that city, writes to say that any member of the profession or student will be welcomed to the meeting and tea. Full particulars will be announced later, but at this meeting Mr. N. S. Barron will read a paper on "Anærobic Diseases in Sheep."

Diseases of Animals Acts

SUMMARY OF RETURNS

Period.	Anthrax.		Foot-and-Mouth Disease.		Parasitic§ Mange.		Sheep Scab.	Swine Fever.	
	Out-breaks con-firmed.	Animals attacked.	Out-breaks con-firmed.	Animals slaugh-tered as diseased or ex-posed to infection.	Out-breaks reported by the Local Authori-ties.	Animals attacked.	Out-breaks con-firmed.	Out-breaks con-firmed.	Swine slaugh-tered.
	No.	No.	No.	No.	No.	No.	No.	No.	No.
Period 1st to 15th Dec., 1935	24	26	—	—	4	7	62	105	59
Corresponding period in									
1934	16	18	14	2,253	3	3	52	96	65
1933	10	10	—	—	3	3	90	70	33
1932	18	21	1	79	4	6	48	45	12
Total 1st January to 15th Dec., 1935	362	417	50	11,787	96	218	434	1,965	1,180
Corresponding period in									
1934	371	419	75	9,906	112	184	639	1,727	981
1933	278	324	87	7,805	128	216	525	1,366	890
1932	327	396	18	1,422	121	186	307	1,512	733

NOTE.—The figures for the current year are approximate only. § Excluding outbreaks in Army Horses.